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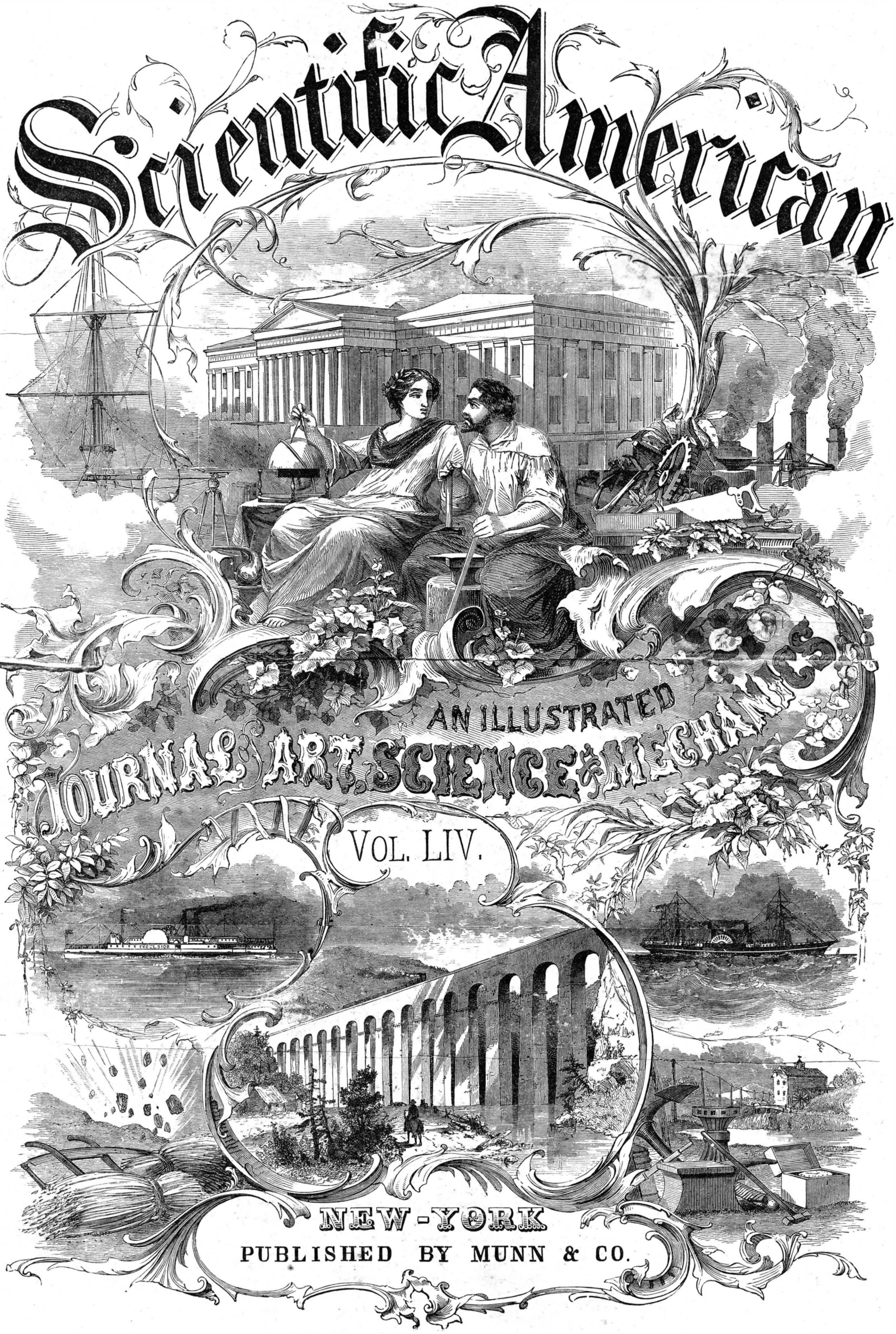

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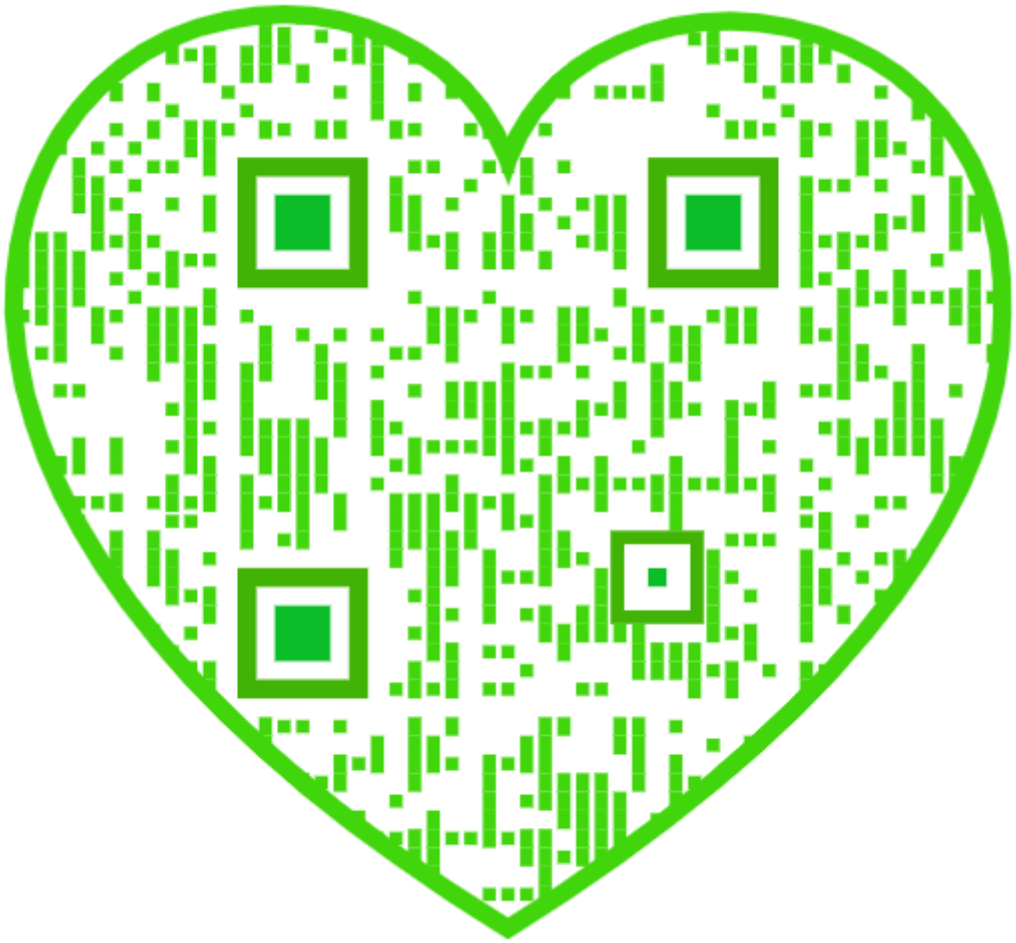

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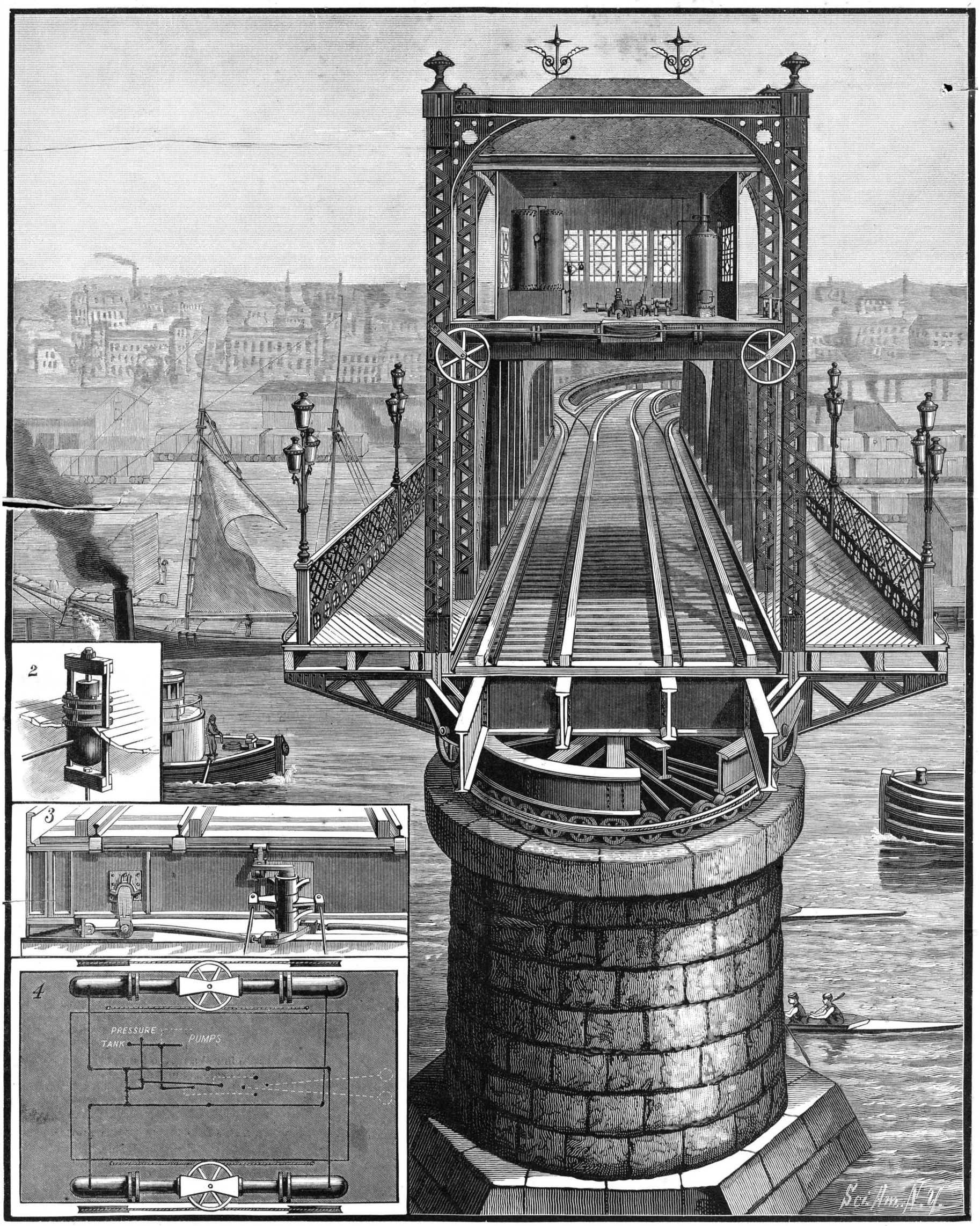

HYDRAULIC MACHINERY FOR OPERATING THE DRAWBRIDGE ACROSS THE HARLEM RIVER AT SECOND AVE. N. Y. CITY.—[See page 6.]

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IMPROVE THE CHANNELWAYS.

The gradual shoaling, or filling up, of the harbor of New York has long been a cause of anxiety to those interested in the commerce of the port. The big steamers as they pass in and out constantly find bottom where before they ran clear, and the pilots complain that, unless something is soon done, it will become a difficult feat to guide the heaviest draught ships safely in, save under phenomenal conditions of tide. A hydrographic survey of the port and its approaches has been for some time in progress, and this serves only to corroborate the assertion made by the pilots that the channels are filling up.

Last week the agents of the transatlantic steamship lines appealed to the Chamber of Commerce to have something done in the way of deepening the channels. They say:

"Builders have now to construct vessels with limited draught to suit this particular port; but even under these restrictions they at times run great danger in having to drag themselves through the sand and mud, and over exceedingly shoal places, when the least error in handling or failure in machinery might cause most disastrous results, not only to property, but to human lives. New York requires a channel having a constant depth of not less than thirty feet and a width sufficient to allow ample working room for vessels to steam full speed through it at all states of the weather and tides, day or night; otherwise, she cannot retain the prominence and business she has a right to expect."

In response to this, the Chamber passed a resolution in which it is decided to ask Congress to appropriate money for the deepening and widening of a channel which shall have a depth of thirty feet at mean low water.

It seems proper that a body containing so many public-spirited citizens and merchants identified with the commerce of the port should take steps looking to its commercial welfare, and yet it cannot be denied that such attempts often fall short of their mark, and miscarry, by reason of ill-advised recommendations on the part of those who draw up the resolutions. Only recently the work of improving Gedney's channel was stopped after $80,000 had been thrown away, because Nature did not act in the way the directions going with the appropriations insisted it should. Congress was asked to appropriate $200,000 for loosening the sand at the bottom of Gedney's channel, it being declared that when thus loosened Nature would do the rest by carrying it safely out to sea on the ebb tide. Congress did what was expected of it, but Nature didn't, and there remains at this moment, so far as the lead line will determine, the same quantity of material at the bottom of Gedney's channel as there was before the work was begun, and also an unexpended balance of $120,000 in the hands of the government agents.

Apparently regardless of the result of this abortive attempt to interpret Nature's processes, the Chamber of Commerce last week pledged itself through its resolutions to "suggest" to Congress:

"That such contract have all payments conditioned upon actual accomplishment of work to the value of such payments, and the profits to be largely, if not wholly, dependent on the demonstration of the ability of such channel to maintain itself in depth and width chiefly by the operations of Nature after complete construction."

In other words, the prospective contractor must practically assent to the proposition that Nature will keep the channel clear by the process known as "scour" when he shall have once dredged it to the required depth.

It seems to be forgotten that the principal cause of the filling up of these channelways is the unlawful dumping of refuse into the waters of the harbor.

The intelligent physician always seeks to remove the cause which produced his patient's malady before seeking to give relief, and the physical hydrographer, if capable, would naturally seek to remove the causes of bar or shoal formation before beginning their forcible removal.

It was in this way Mr. Eads succeeded in removing the bars at the mouths of the Mississippi below New Orleans. The law says that the garbage scows must be dumped three leagues outside of Sandy Hook on the first of the ebb tide, and also fixes a severe penalty for throwing ashes and clinker into the bay or rivers from steam vessels. Yet it is well known by those who have looked into the matter that the scows are unloaded as soon as they are sufficiently far from land to escape detection. As a matter of fact, under conditions of wind and sea which often prevail, the loaded scows could not live at the distance to sea they are expected to go. As to the steamers, steamboats, and tugs, most of them dump wherever it is most convenient.

The writer, who assisted in a physical survey made of New York harbor by the United States Coast Survey some years since, can testify that marked material dumped in the bay and the North and East rivers found its way into the Swash, the East, Gedney's, and the main ship channel, and that dredgings in these channels disclosed the fact that they were partially filled with ashes, clinker, and other foreign material. Stop this unlawful dumping first, and dredge out the channels afterward.

THE BELL TELEPHONE CASE.

Associated Press reports state that the Interior Department has decided to recommend that the Attorney-General authorize suit to be brought in the name of the United States to test the validity of Bell's original patent. Although the full text of the decision will not appear for some days, it is said that it will set forth, among other things, that "the specification of Bell's patent contains nothing about the capability of Bell's instrument to transmit articulate speech, but only claims for it the power to transmit 'vocal sounds;' that an instrument may transmit 'vocal sounds' without being a speaking telephone; and that, in point of fact, Bell did not invent a speaking telephone until after the issue of his patent, as appears from the record." For these reasons, it will be urged, the validity of the Bell patent is fairly questionable.

An Enormous Granite Slab.

To separate from the main ledge a slab of granite 354 feet long, 3 to 4 feet thick, and 11 feet wide, is no ordinary feat to accomplish.

But this has been done at the Flynt Granite quarry, in Monson, Mass., and by the means usual in all quarries for separating slabs or blocks from the main ledge. A row of wedges were set, several hundred in number, and the workmen beginning at one end gently and carefully tapped the wedges, moving by degrees down the line, until the other end of them was reached, when the same operation was repeated.

In this manner, by careful and patient application, aided by favorable conditions of the weather, the slab of the above phenomenal size was successfully separated from the main rock.

The value of this immense slab, if it could have been transferred safely to one of our large cities, at not too great cost, would have been several thousand dollars. And it seemed almost sacrilegious that it was necessary to cut it up into smaller blocks for transportation and finally used for ordinary building purposes.

The possibility of getting out a slab of such size without breaking it indicates that the grain of the Monson granite not only runs evenly, but that it possesses great tenacity.

Separation of Solder from Old Zinc.

According to the *Revue Industrielle*, a new method has been introduced by M. Piallat for dealing with the clippings, shavings, turnings, and other forms of waste zinc resulting from various manufactures. The values of these forms of old zinc are very much lower than that of new zinc, because there is always an amount of solder present which spoils the zinc for rolling and for most other direct uses, and the difference in value is so considerable that M. Piallat considered the subject of treating this zinc debris to be well worth study and experiment. It is stated that he has fully succeeded in making a very profitable success of his labors.

He places the zinc cuttings, etc., in a sort of basket, in which they can be subjected to heat and to centrifugal force at the same time. The actual basket-like container is surrounded by an outer envelope. Superheated steam or heated air can be used, and the temperature regulated as desired. Under the influence of the heat and the centrifugal action, the solder is melted, detached from the zinc, and driven to the exterior of the container, where it collects and is drawn off. The solder thus collected is remelted and cast into bars. It is stated that the value of it alone will pay all the costs of the operation. The zinc remaining after this operation is further purified by fusion. It is then very suitable for use in making small castings, and can be sold at lower price than the brands of zinc which are now specially in use for this purpose.

This branch of trade is stated to be of considerable importance, great quantities of zinc being used in Paris alone for casting figures and in clock making. M. Piallat estimates that one of his machines, working ten hours per day, can extract the solder from three tons of old zinc. This amount of purified zinc will be too great to be all disposed of for casting purposes, and so the remainder is to be rendered pure and soft enough for rolling into sheets. It is stated that M. Piallat has also found a method of purification far superior to any in ordinary use, and producing a better quality of metal than any on the market, but this method is kept secret at present.

Wash-bottle for Chemical Laboratories.

Mr. J. F. Sleeper, of Portland, Maine, writes us that the improved washing apparatus for laboratory use, which was described by Mr. H. B. Battle in our issue of November 28, was first invented by himself a number of years ago, and introduced by him in a modified form into the Government Assay Office in New York. He says it was in practical operation for a couple of years, and gave complete satisfaction.

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NIGHT SKY.—DECEMBER AND JANUARY.

BY RICHARD A. PROCTOR.

The Great Bear (*Ursa Major*) is now rising well above the horizon, in the northeast, the pointers about midway between north and northeast. A line from the Pole Star to the Guardians of the Pole is now in the position of the minute hand of a clock about 28 minutes past the hour. The Dragon (*Draco*) lies due north, curving round under the Little Bear, its head close to the horizon. Low down in the northwest is a part of the Swan (*Cygnus*). Higher up we see King *Cepheus*, his wife *Cassiopeia*, and their daughter *Andromeda* (the Seated Lady and Chained Lady, respectively), with the Rescuer, *Perseus*, nearly overhead. The Winged Horse is setting, his head close by the western horizon, and near the jar of the Water Bearer (*Aquarius*).

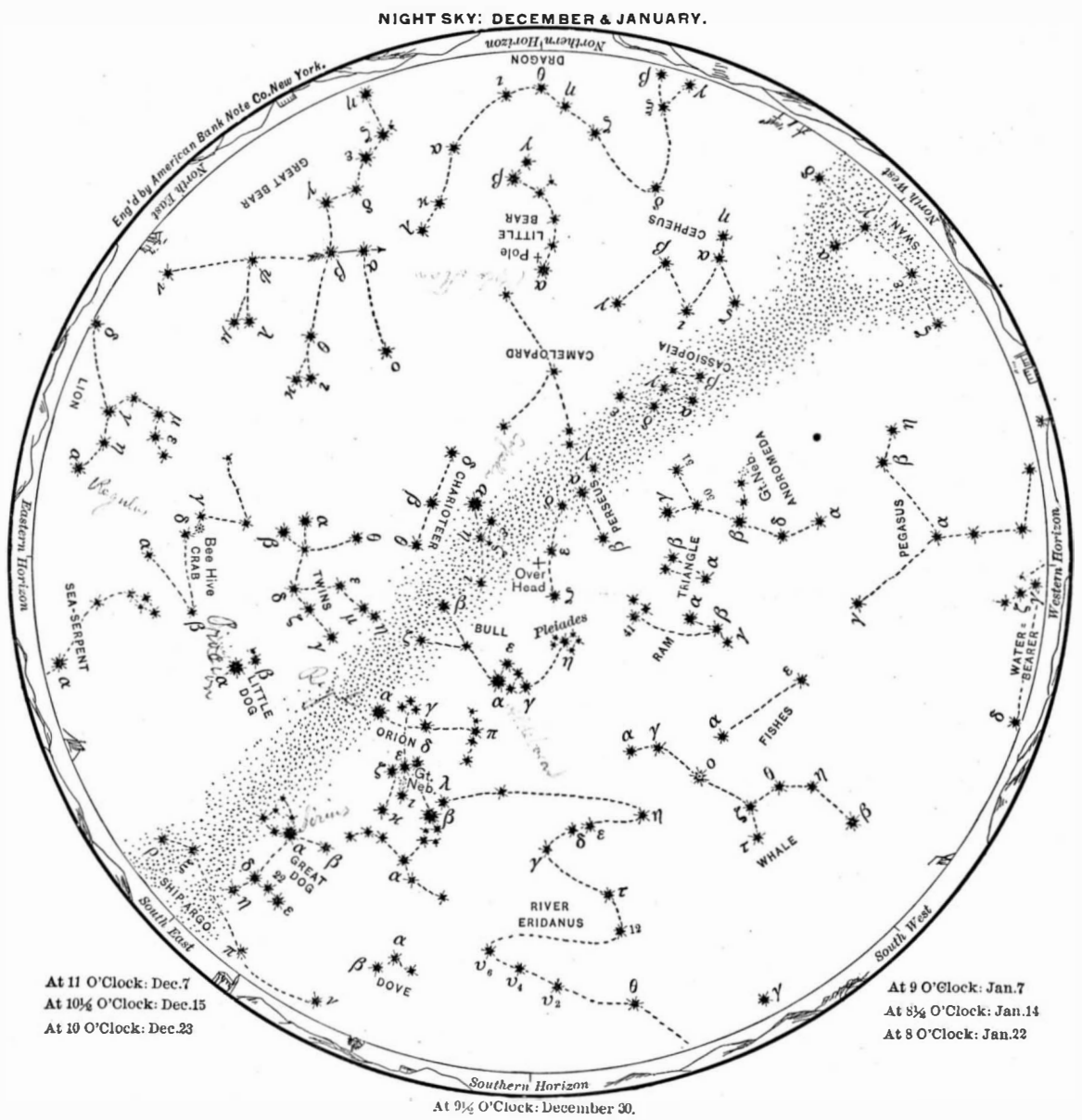
In the southwest is the Whale, and close by the constellation *Pisces*, or the Fishes; above them the Ram (*Aries*), between which and Andromeda the Triangle can be seen.

In the south the River *Eridanus* makes now its best show. Its leading brilliant, *Achernar*, is, however, never seen in the United States. In the southwest the Great Dog with the splendid Sirius ("which brightliest shines when laved of ocean's wave") shows resplendently. Above is Orion, now standing upright, treading on the Hare (*Lepus*) and facing the Bull (*Taurus*), now at its highest. The Dove (*Columba*) below the Hare is a modern and not very interesting constellation.

The Little Dog (*Canis Minor*) is on the east of Orion. In the east the Sea Serpent (*Hydra*) is rising, and due east a little higher we find *Cancer*, the Crab (note the pretty cluster called the Bee Hive—*Præsepe*); above are the Twins (*Gemini*), and above them the Charioteer (*Auriga*), with the bright Capella, nearly overhead.

The Lion is rising in the northwest, his heart star Regulus (α) being low down a little north of east.

Lastly, due north, high up, the absurd Giraffe (*Camelopardus*) stands proudly on his ridiculous head.



In the map, stars of the first magnitude are eight-pointed; second magnitude, six-pointed; third magnitude, five-pointed; fourth magnitude (a few), four-pointed; fifth magnitude (very few), three-pointed, counting the points only as shown in the solid outline, without the intermediate lines signifying star rays.

Prof. John C. Draper.

Dr. John C. Draper died at his residence in New York city, on Dec. 20, after three days' illness from pneumonia. He was born in Prince Edward County, Va., in 1835, and was educated at the University of the city of New York. After graduation, he spent a year abroad. He occupied positions of responsibility at different times in Bellevue Hospital, the University, and Cooper Institute. During the war, he acted as volunteer surgeon, and at the time of his death occupied the chair of physiology and natural history at New York College, and of chemistry in the medical department of the University. As an investigator and writer, Dr. Draper attained considerable distinction. He was connected for some years with *Scribner's Magazine*, and just before his death published an advanced text-book on medical physics, which promises to be of much importance.

The Prevalence of Hydrophobia.

Hydrophobia is so terrible a disease that for many years undoubted cases of the malady have been reported by the newspapers with almost the same regularity that they have chronicled murders, suicides, or other tragedies. It is therefore impossible to believe, as has been suggested, that the present unfortunate abundance of news of this character has been called forth by the widespread discussion of Pasteur's researches. The dreaded malady has made its appearance in so many and such widely separated districts that it has almost the appearance of an epidemic. In various parts of the Continent—in Russia, Austria, Switzerland, France—numerous individuals have been bitten by rabid dogs, and many of them have suffered a terrible death. Others undertook the journey to Paris, and are now under treatment, while a few less fortunate ones left their homes only to be stricken down on the way. In England it has been particularly prevalent, and has occasioned much alarm. It is a country which is never altogether free from the disease, but during the past few weeks the outbreak has been of unusual extent. In London, which, next to Lancashire and the West Riding of Yorkshire, is pronounced by the *Lancet* to be the home of rabies, so many cases have occurred that a lively discussion, both legal and medical, has been provoked. It is complained that there is a great laxity in the laws regulating the destination of stray dogs, and an even greater carelessness in enforcing those enactments which already exist. At each epidemic there is a general outcry, but with the disappearance of the disease the cry is soon stifled, and the reappearance of the epidemic made possible. Children are particularly susceptible to attack from rabid animals. Their size and strength make the encounter very unequal. When bitten, the child is usually in much greater danger than the adult, since the bite is more apt to be on the bare skin, where no clothing can hinder the virus from coming in contact with the blood. The London outbreak has raised the old question of whether there is such a disease in man as hydrophobia, or whether it is not simply an affection of the imagination. A respectable minority still deny its existence, in spite of the apparently unequivocal demonstration brought by the last few weeks. It is probable that in a number of cases death has been the result of a morbid imagination, just as people have been able to worry themselves into consumption or other maladies; but there are many other cases in which such a comfortable hypothesis is no longer tenable. The greatest mortality, as we have said, is among children; and though usually the possessors of a very vivid imagination, they are seldom permitted to exercise it to their own destruction. In many cases their fatal illness has been their first information about hydrophobia; while under any circumstances a parent of any discretion; after doing everything possible for the child, would silence its apprehension, and permit no mention to be made of impending danger.

In America, an equal alarm has been felt, for seldom if ever, have so many cases of rabies been reported, and the shadow of death hangs over a number of communities. The most severe outbreak has been at Newark, N. J., and the towns in the immediate neighborhood. It has been sufficient to cause an organized crusade against the dogs. Several of the persons bitten have died, and grave apprehension is felt for a number more. In addition to the four children sent to Pasteur in charge of Dr. Billings, two or three other patients are now on their way to Paris for treatment. Some of these go at their own expense, while others, not able to afford such a journey, owe their opportunity to public generosity. The epidemic seems spreading in New Jersey. Each day bring news of more rabid dogs and more injured people. The list is already very large; and should only the usual 50 per cent of those bitten develop hydrophobia, the suffering and death in store will be appalling. In the West, cases in several localities have been reported. At Milwaukee, Wis., much alarm has been felt. One of the victims, a Bohemian workman, who was bitten in the latter part of November, developed premonitory symptoms of hydrophobia. As the theory had been advanced that a Turkish bath was an excellent preventive, he submitted to several hours in the sweating room, and at last reports had recovered his usual health.

We have recorded his case because, being an ignorant man, and unacquainted with the symptoms of hydrophobia, his attack cannot possibly be ascribed to the effect of imagination. These details have been repeated in so many communities throughout the land that some relief action becomes imperative. It is to be hoped that the widespread alarm will be productive of such preventive measures as getting rid of all stray dogs at once, and of a thorough investigation of Pasteur's method of treatment. If his treatment prove effective, we are permitting an unnecessary sacrifice of life. If not, it is time that some other clew should be followed.

Electrical Selenium Plates.

The plates of Mr. Ch. E. Fritts, of New York, are described as consisting of a thin, homogeneous sheet of selenium, spread upon a metal plate, and covered over with a fine gold leaf.

The illumination of the gold leaf by direct sunlight increases the conductivity of the selenium plate to an enormous extent. By means of a modification of this simple apparatus, Mr. Fritts now believes that he can accomplish the conversion of the greater portion of the energy of light into electrical energy, and if so, we may, ere long, see the photo-electric plate competing with the dynamo electric machine itself. Thus, for instance, the light of the sun would be converted into electricity, and the latter again into light.

These and similar experiments in which selenium is largely employed attach considerable importance to new methods of procuring this valuable substance. New seleniferous minerals are spoken of as existing in California and Bolivia, but the main source of this element at present is the flue dust and red acid deposits which arise from the manufacture of sulphuric acid from pyrites. The selenium originally present in the pyrites is met with in every stage of the process. All that is required is some economical method of concentrating it, and so collecting it all together.

Whales off Long Island.

The neighborhood of Easthampton, L. I., was thrown into considerable excitement on the 12th of December by the announcement that several whales had been sighted to the southwest, and about five miles out. The whalers started after their game at once, and succeeded in capturing two, a large bull and a cow. The fight lasted over an hour, and carried the hunters fifteen miles out to sea. The animals were towed back to shore, and landed on the beach at Amagansett. The bull measured fifty feet in length, and the cow seventy feet. It is estimated that they will yield from 125 to 150 barrels of oil and about 1,800 pounds of bone. The net profit will probably amount to several thousand dollars. It is seldom that the whale appears on this coast so early in the season, and the fact of the double capture has raised anticipations of a prosperous winter's work.

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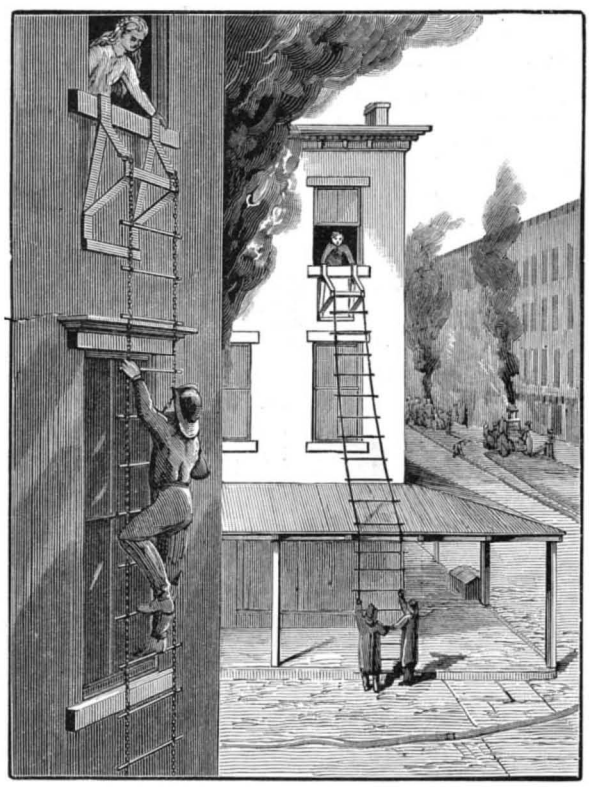
FIRE ESCAPE LADDER.

The rounds of the ladder are connected to opposite side ropes or chains by tying the ropes around the rounds near their ends, the rounds being reduced in diameter at these points to prevent slipping. The upper end of the ladder is supported by a metal hanger or frame, the shape of which is clearly shown

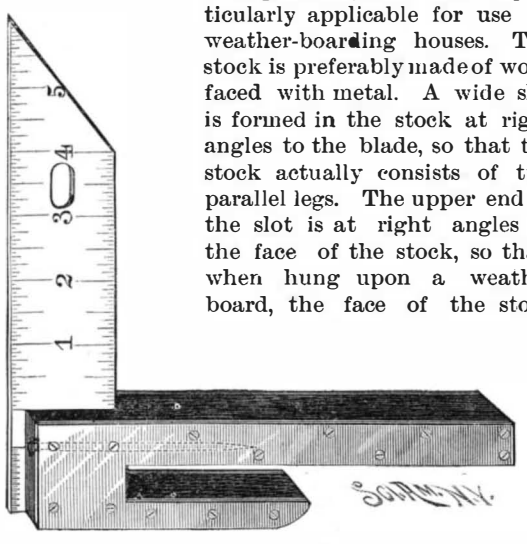


ROSE'S FIRE ESCAPE LADDER.

in the engraving. The upper ends of the sides of the hanger are bent to form inwardly projecting hooks, which are adapted to be caught over and behind the window sill, to give a strong support to the hanger and consequently to the ladder. It will be seen that the ladder hangs clear of the capstones and sills of the windows below the hanger. The lower round is made of such length that it may be extended across a window if it should be necessary to support the ladder from that end. The ends of this round also form handles, by which the lower end of the ladder may be drawn back from the building. It is evident that the ladder may be rolled up and stored away with the hanger; the apparatus is always ready for use, and requires but a few moments to place it in position. This invention has been patented by Mr. Alexander Rose, of Lawrence, Kansas.

IMPROVED SQUARE.

This square is for the use of carpenters and other wood workers in marking out their work in order to form perfect joints, and is particularly applicable for use in weather-boarding houses. The stock is preferably made of wood faced with metal. A wide slot is formed in the stock at right angles to the blade, so that the stock actually consists of two parallel legs. The upper end of the slot is at right angles to the face of the stock, so that, when hung upon a weather board, the face of the stock



SEARGEANT'S IMPROVED SQUARE.

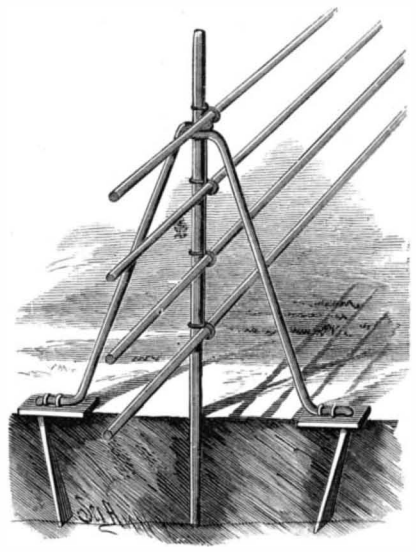
gives a line at right angles to the edge of the board. The blade is graduated as shown, and its projecting end is beveled, in order that it may be used in marking miters. By the use of this square, accurate joints may be formed at the points where the boards abut against the window casings and the corner boards, and in such cases the board is placed in the slot, the outer edge of the stock is brought in line with the casing or corner board, and the board is marked at the exact point where it is to be cut. The square may also be used for all ordinary purposes. In the blade is a hole, so that the square can be hung upon a peg or nail. This invention has been patented by Mr. William F. Seargeant, of Marshall, Missouri.

A Fall of 250 Feet without Severe Injury.

Dr. Evans relates, in the Bristol *Med. Chirurg. Journal*, the history of a girl who attempted suicide on May 8, by jumping from the Clifton Suspension Bridge. The bridge is 250 feet high, and has been a favorite place for suicides. Sixteen persons have been known to have succeeded in self-destruction by making this same leap. One other only was picked up alive, but survived only thirty minutes. Twenty days after the fall the patient was considered convalescent and able to walk without pain. There was apparently no permanent injury. As far as the writer knows, no case of survival after a fall from as great a height as 150 feet has hitherto been recorded, and considers this instance as probably unique.

FARM FENCE POST.

The central part of the post is made of an iron rod, to which the wires forming the panels of the fence are secured. A rod bent spirally in the middle of its length, to form an eye for receiving the center rod, is bent to the form clearly shown in the engraving. The extremities of the rod are bent downward, and inclined slightly inward; near the ends of this rod shoulders are formed. When the post is to be used in hard ground, the main rod is driven vertically into the earth, the eye of the brace is placed on it, and the flattened extremities are either driven into the earth or



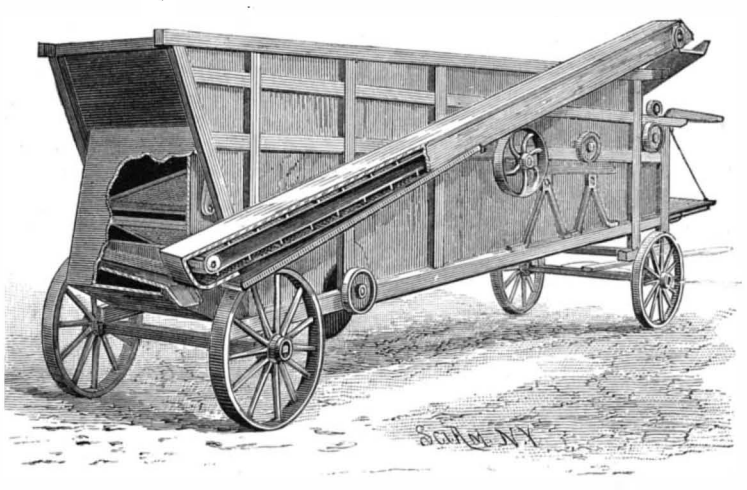
HICKS' FARM FENCE POST.

set in holes with the earth tamped around them. When the post is set in soft ground, bearing plates are placed under the shoulders; these plates are apertured to receive the rods, to which they are secured by staples. The posts may be made of half inch iron, and the panels of any wire of suitable size. A fence so constructed has great rigidity with but little weight, and may be quickly erected or taken down.

Further particulars may be obtained from the inventor, Mr. Samuel Hicks, of Orangeville, Ind.

A SEPARATOR TO REMOVE IMPURITIES FROM WHEAT.

In connection with an ordinary grain separator and thrasher, the invention herewith illustrated shows a novel construction and arrangement of parts to facilitate the removal of cheat and other small seeds and impurities from wheat. An opening in the bottom of the elevator trough is covered with a wire screen of such fineness of mesh as to prevent kernels of wheat from passing through, while allowing the passage of finer particles; and this screen is protected from being worn or injured by the friction of the elevator lags by wires placed on the screen longitudinally with the elevator trough, and attached at their ends to stationary parts of the trough bottom. These wires are so put in as to serve for ways on which the elevator lags slide, while the lags themselves come so close to the screen that no kernels of wheat will be left thereon. In the trough of the shoe at the lower end, shown in the engraving in a part broken away, is another fine screen for sifting out small seeds and impurities, and conducting them away into a separate discharge spout.



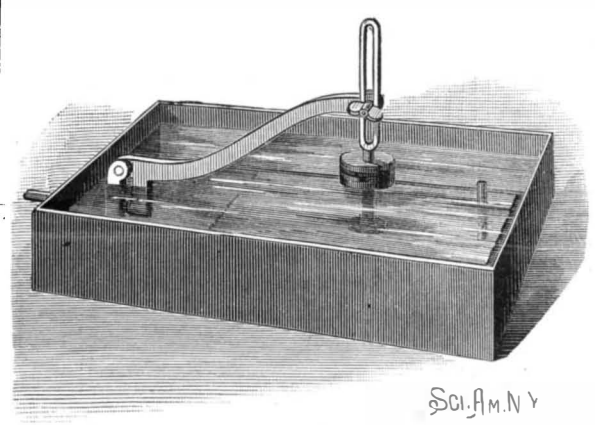
HAWLEY'S GRAIN SEPARATOR.

This invention has been patented by Mr. Andrew T. Hawley, of Alton, Ill.

THE Machine Tool Works, Fred'k B. Miles, Engineer, Philadelphia, has been united with the Industrial Works, William B. Bement & Son, Callowhill and Twenty-first Streets, Philadelphia, and the two establishments are conducted as one by William B. Bement, Clarence S. Bement, Fred'k B. Miles, and William P. Bement, under the firm name of Bement, Miles & Co.

AUTOMATIC DISCHARGER FOR EVAPORATING PANS.

A discharger for evaporating pans, recently invented by Mr. M. E. Sprague, of Plymouth, Vermont, is so constructed as to automatically open an outlet near the bottom of the pan, when the liquid being evaporated has reached the desired density. A hollow float, having a vent tube to allow for the expansion of the air, is provided with an upwardly projecting stem, which may be weighted, as shown. The stem terminates in a slotted portion, to which the free end of a curved lever is adjustably attached. At its fixed, pivoted end the lever is formed with a downwardly projecting arm, which carries a valve. This valve is adjusted to close the outlet of the evaporating pan so long as the hollow float rests upon the bottom. In



AUTOMATIC DISCHARGER FOR EVAPORATING PANS.

operation, the lever is so weighted that the float will not rise until the liquid has reached the proper degree of evaporation. When this point is reached, the rising of the float moves the lever upward, and consequently its downwardly extending arm and valve on the same outward, by which the outlet of the pan is uncovered, and the liquid is automatically discharged. In our illustration, the float is shown resting on the bottom of the pan, and the outlet closed. The adjustable connection between the lever and the stem of the float permits the device to be used on pans of different depths. The discharger is applicable in concentrating sirup, brine, and other liquids, and aims to secure their automatic discharge at any degree of concentration desired.

The Treatment of Obesity.

Starvation, semi-starvation, surcharging, "banting," alkalies, purgatives, Turkish baths, exercise, and the thousand and one ways of reducing corpulency to respectable dimensions, still leave a large section of our stout population in despair. M. Germain See comes to the rescue, and solves (?) the difficulty with his accustomed dash and skill. "Oh, ye massive fat ones desiring to be made lean, eat not much meat, but drink enormously of tea." That is M. See's good news put in a nutshell. That is the cry now to be heard in the Parisian wilderness of fat. Obese individuals may suffer from shortness of breath from many causes, writes M. See, and infiltration of the muscles with fat is an important one. There are many ways of reducing the fat. The first is by diet, the second by moderating the imbibition of fluid, the third by muscular exercise; and there are also balneotherapy, or bathing, and treatment by medicaments. M. See does not approve of "banting," as it takes too long; and further, he argues that proteids, such as meat, eggs, etc., are productive of fat. Ebstein has recently advocated "banting," combined with some fatty food; but our author does not fall in with this method. Stout people do not bear bleeding well, although this was the treatment in vogue in the sixteenth and seventeenth centuries. Iodides, alkalies, and diuretics are not well borne by fat persons. Moreover, these medicines, when they reduce obesity, do so by destroying, or at least damaging, the organs on which the nutrition of the body depends.—*Lancet.*

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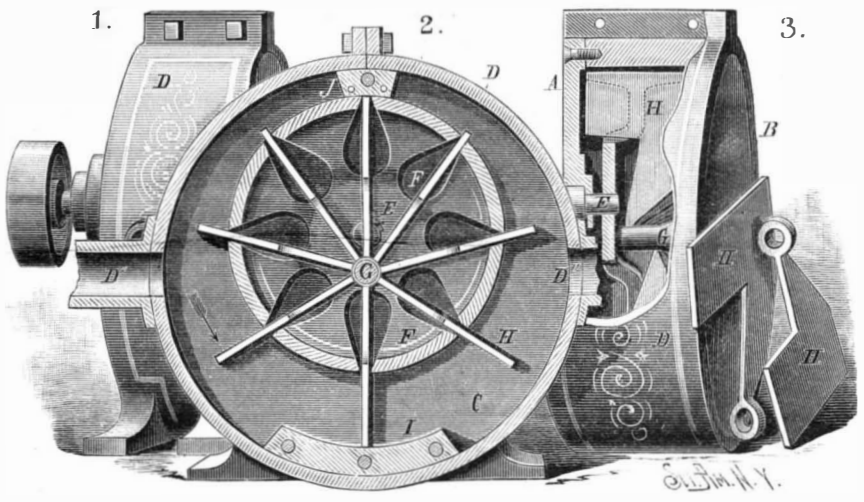
IMPROVED MOTOR.

The motor herewith illustrated can be driven by either water, steam, compressed air, or other fluid. The disks, A B, are encircled by the shell, D, which is provided with an inlet opening, D^1, and outlet opening, D^2. The shaft, E, is mounted in one of the disks, and is furnished, on its outside, with a pulley; the inner end carries the wheel, F, formed with recesses, F^1, shaped as shown in the sectional elevation, Fig. 2. The rim of this wheel bears against the inner faces of the disks. In the center of the disk, B, is a pin, G, placed eccentrically as compared with the shaft, E, and having a reduced portion forming a bearing for the inner ends of the sliding arms or pistons, H, which are placed with their outer ends in the recesses in the wheel, F.



BURRY'S IMPROVED MOTOR.

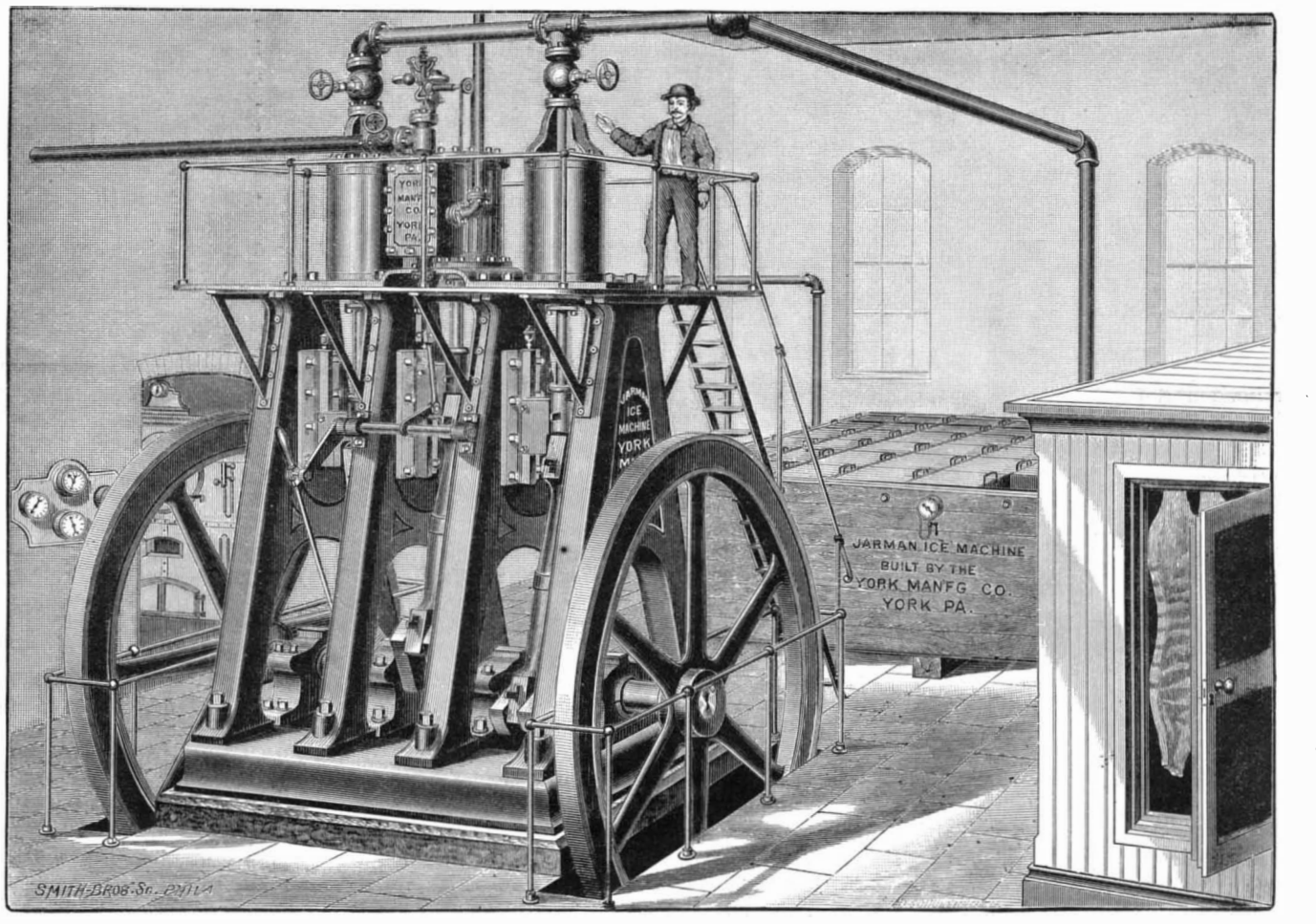
The outer ends of the arms are as wide as the rim of the wheel; and as the wheel and arms are eccentric with each other, the outer ends of the arms recede or advance in the recesses when the motor is in motion. The symmetrically shaped crosspieces, I and J, in conjunction with the wheel and sliding arms, divide the space between the disks in two equal parts, one of which is in direct connection with the inlet opening, and the other with the outlet.

The fluid by which the motor is driven enters through the opening, D^1, and presses against that part of the arms projecting beyond the rim of the wheel, causing the arms and wheel to rotate in the direction of the arrow. As soon as one of the arms leaves the rear end of the crosspiece, I, the next following arm will enter on the front end of the crosspiece; the fluid will flow out through the opening, D^2, and will be prevented from re-entering the first half of the space by the crosspieces. The shaft, E, is rotated, and the power thus obtained can be utilized in any desirable manner by proper connections with the pulley.

This invention has been patented by Mr. John Burry, of Fort Reno, Indian Territory.

THE JARMAN ICE MACHINE.

The accompanying engraving represents the "Jarman" ice and refrigerating apparatus, manufactured by the York Manufacturing Company, of York, Pa. These machines possess many features well deserving attention, and are suitable for any place where artificial ice or artificial low temperature is desired; and they are especially adapted for use in warm climates or on ocean steamers, owing to their simplicity and small consumption of water and fuel. The manufacturers claim that this machine has fewer movable parts than any other machine in the market, thereby rendering it less liable to get out of order. It is also claimed that it only requires from one-eighth to one-tenth the quantity of chemicals to reach the same results obtained by other machines; and consequently, not having the same resistance to overcome, it can be run at a very low rate of speed, which naturally reduces the wear and tear, and causes a great saving in fuel; and by a special system of piping a result nearly double is obtained in comparison with the old system in use in some other ice machines. The builders of the "Jarman" ice machine will furnish all further particulars regarding their apparatus, and may be addressed on all subjects relating to the manufacture of artificial ice.



THE JARMAN ICE AND REFRIGERATING MACHINE.

A Remarkable Stroke of Lightning.

The Granite Falls *Journal*, Minnesota, gives an account by N. O. Carle and Christian Olson, farmers of Granite Falls, of the remarkable results of a stroke of lightning which struck the prairie about a mile and a half from Olson's house. It occurred in June last, during a heavy storm.

They say it made a hole in the ground between five and six feet across, and nearly six feet deep, and from this hole there extend six trenches two feet deep, branching off in different directions, and extending for a distance of from six to eight rods. And what was very singular, not a particle of the sod and dirt thrown from the hole and trenches was to be seen, except now and then a large piece of sod twenty or thirty rods away. Mr. Olson says that by actual measurement the ditches plowed out by the lightning from where it struck were all of an equal distance apart; four of them were of the same length, and the other two six feet shorter. The report is said to have been as terrible as if an explosion had occurred. A lady sitting at a window in a house a mile away sensibly felt the shock; two men were sitting outside another house a mile away from the scene, and so forcibly did they feel it that they immediately jumped to their feet and went into the house without speaking. Mr. C. A. Bennett, editor of the *Journal*, writes us that he vouches for the truthfulness of the above account.

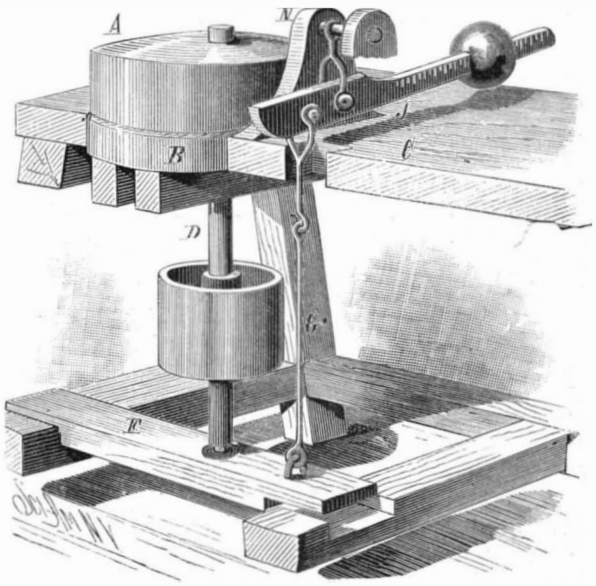
Japanese Patents.

The Japanese Assistant Secretary of State, Koerhiyo Takahaski, a dignitary whose duties are confined chiefly to the Department of Commerce and Agriculture, is now in America, and will visit Washington and the Eastern cities. His mission to this country is to study the American patent system, with a view to improving the administration of that department in his own country. Since the Japanese patent law went into effect, last July, an average of two applications a day have been filed. These have been mainly for patents for agricultural machinery.

IMPROVED GRINDING MILL.

Mr. B. J. Du Bose, of Lisbon (Goshen P. O.), Ga., has patented an improved grinding mill in which the top stone, or runner, is automatically adjusted by a novel arrangement of balances, so as to insure a uniform grinding without the constant attention of the miller.

In the class of mills to which his invention applies, the weight of the runner is upheld by the bridge tree and by the reaction of the grain being ground; but as the expansion and contraction of the runner spindle and other circumstances make the pressure borne by the grain far from constant, the operation of the mill requires careful attention to insure uniformity. In the improved form, the bridge tree, F, supporting the runner spindle, D, is fulcrumed at one end to the mill frame, and has its free end connected by means of the rod, G, and link to the short end of a scale beam or lever, J. A weight or counterpoise is placed on the long arm of the beam, and may be adjusted in different positions.



DU BOSE'S IMPROVED GRINDING MILL.

The distance between the pivotal point of the beam itself and that of the link supporting the bridge tree is such that the movement of the beam between its extreme positions will be comparatively slight. The length of the beam is so determined that the counterpoise, when near the outer end of the long arm, will about balance the weight of the bridge tree and runner stone.

By the arrangement of the beam directly over the free end of the bridge tree, its center of gravity being likewise its center of motion, a delicate balance is established; so that by adjusting the counterpoise nearer or further from the fulcrum of the beam, more or less of the weight of the runner becomes effective in grinding, and this may be determined independently of expansion and contraction of the runner spindle, or other accidental factors. The construction is simple and inexpensive, and allows a greater number of stones to be run with the same attendance.

Removing Silver Stains.

Dr. H. W. Vogel, in the *Photographischer Mittheilungen*, recommends, for removing silver stains from the hands, the same compound that has been used as a reducer, *i. e.*, a mixture of ferricyanide of potassium and hyposulphite of soda. A few crystals of the former substance are dissolved in a solution of hypo, or from 10 to 20 per cent of a 20 per cent solution of the ferricyanide may be added to the hypo solution, and applied to the stains. This substance is not poisonous, and does not destroy the color of articles of clothing.

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HYDRAULIC MACHINERY FOR OPERATING A DRAW-BRIDGE.

As generally constructed, the mechanism by means of which a drawbridge is turned requires that a nice adjustment of the parts be always maintained, in order to insure perfect working. Those familiar with such appliances will be interested in the hydraulic machinery designed by Mr. Theodore Cooper, of this city, by which the drawbridge* across the Harlem River near Second Avenue, this city, is operated, because of its extreme simplicity and the reliability of its action under all possible conditions. While doing away with several of the expensive parts to be found in the old style of draw, it performs its duty better, and is not so much affected by ordinary wear and tear; in addition, the one part most liable to wear can be easily, quickly, and cheaply replaced when necessary. Aside from the practical bridge builder, this apparatus is also of interest to the mechanic, since it introduces a simple and ingenious method of accomplishing the rotation. To the general reader it is worthy of study, as it produces a seemingly anomalous movement of the draw, when we consider the direction in which the power is applied. The bridge moves in a direction directly opposite or against that in which the operating ropes ought (apparently) to pull it; in other words, the ropes pull in one direction, and the bridge moves in the contrary direction. This also appears the more strange as there is no connection whatever between the bridge or its machinery and the pier upon which it rests.

The bridge rests and turns upon a ring made up of 54 cast iron coned wheels, 16 inches in diameter at the base; the drum thus formed is 26 feet in diameter. The wheels are held truly radial by two guide rings, one inside and one outside of the wheels; the outer ring is grooved to receive the operating ropes. A tension rod connects the axle of each wheel with a movable center or hub (turning upon a steel shaft 6 inches in diameter), to which the guide rings are also braced by angle iron struts. The axes of the wheels are inclined upward toward the center at such an angle as to bring the upper bearing lines of the wheels in a horizontal plane. Heretofore, the axes of the wheels have been placed in a horizontal plane, thereby compelling the use of two inclined tracks for the wheels to roll between. But in this case the upper bearing plates, forming the upper circular track, are of wrought iron planed flat, while the lower track circle is made of cast iron segments, bolted together and firmly anchored to the masonry; its bearing surface is planed to conform to the inclined position of the wheels. On the upper bearing plate are springs for equalizing the load on the rollers.

The operating ropes—wire cables—are led by properly placed sheaves, as shown in the engraving, to a small room located in the center of the bridge, and the floor of which is at an elevation equal to that of the portals. There are four of these ropes, one at each corner, and the lower ends are secured to the guide ring at diametrically opposite points. These ropes act in pairs; two open the draw, and the other two close it. Those ropes at diagonal corners operate together, or in the same direction. One of these ropes, after being passed around a drum carried in a frame placed between and uniting the plungers of two hydraulic rams —as shown in the inverted plan view of the floor of the operating room, Fig. 4—is secured to the framing at a point alongside of its own ram. The rope that operates in the contrary direction is led around a drum in the same frame, and fastened alongside of the opposite ram. These two ropes are clearly shown in the large view. It will be seen that either of these ropes may be made to pull upon the guide ring, according to the direction in which the rams move. At the other side are two more rams, working together, and two ropes arranged in the same way. Each pair of rams has a stroke of 6 feet, so that the ropes and guide ring to which they are attached have a movement of 12 feet, but the bridge moves 24 feet and turns a quarter of a circle at each stroke. If the lower horizontal portion of the right hand rope shown in the large view be pulled in a direction toward the right, the bridge itself and the guide ring and rollers will move against this pull, or toward the left.

The cylinders of those rams that work together are connected with each other by pipes, as shown in Fig. 4. A small steam pump takes its supply from a tank, and pumps either to the rams or to the accumulators, which are two large wrought iron boiler shells, capable of standing a working pressure of 400 pounds to the square inch; they are simply large air chambers by which to obtain a permanent air pressure. They are so proportioned that, when filled half with water and half with air at 300 pounds pressure, the draw can be swung open and closed again without the use of the pump. The pumps are provided with small air check valves, so that the operator can supply any leakage, and on top of the accumulators is a valve by which any excess of air can be relieved. The piping is provided with the usual safety valve attached to hydraulic machinery. A four-way valve guides the water to and from the rams. As the working rams are operating, the remaining two push the water back into the supply tank.

To provide for the case when the bridge may have a large momentum, and the operator desires to reverse or break the movement of the draw to prevent the water ram which would occur on the non-operating rams, the supply pipes are furnished with check valves, which lift and connect with the accumulators, thereby allowing the bridge to cushion on the air in the accumulators.

A small pump is introduced for the purpose of getting a plunger small enough to be worked by hand during repairs to the boiler. By the use of this pump, driven by hand, and the accumulators, which can be pumped up when the draw is not in operation, the addition of the ordinary hand gear was considered unnecessary.

The wedges are operated by two small rams—one is shown in Fig. 2, and both are shown to the right of the engine room in the main view—connected by rods with the arms of a bell crank in bearings secured to the floor beams at each end of the bridge. To the lower arms of these cranks are attached rods which move the wedges and rollers; the movement of this bell crank also locks and unlocks the bridge. In closing, the ends of the bridge swing clear of the masonry; when closed, water is admitted to the proper ram, which then turns the bell crank at each end of the bridge. The arms carrying the rollers approach the vertical position shown in Fig. 3, and each wedge moves in the same direction as its own roller, but not so fast. The ends of the bridge now rest upon the rollers, which in turn rest upon heavy iron plates on the masonry. The speed of the wedges is now increased, and they come to a bearing; the rollers move a little further, and the ends of the bridge are supported by the wedges. When the other ram works, the ends of the bridge are lifted by the rollers, the wedges are withdrawn, and the bridge is free to swing. The same hydraulic pressure, but of course controlled by an independent valve, operates these rams.

The liquid used in the rams is glycerine mixed with water in such proportion as to be unaffected by the coldest weather.

The main object of employing this form of mechanism for operating draws was the avoidance of toothed gear of any kind—a class of mechanism which usually gives a great deal of trouble on drawbridges because of the difficulty of getting a positive control of the bridge during high winds. This is caused by the necessary slackness of the gear, due to back lash, which permits the knocking of the bridge back and forth. A very small play between the teeth of the gears is sufficient to allow the ends of the bridge a considerable movement. The method above described differs from those employing gears, as there is no possibility of any of its parts binding so as to prevent the moving of the draw. An even bearing upon the rollers, if there should be a distortion of the bridge, is always obtained by the equalizing springs.

* This bridge was described and illustrated in the SCIENTIFIC AMERICAN of Aug. 1, 1885.

Invention of the Telephone.

To the Editor of the Scientific American:

I have read with much interest your articles on the invention of the telephone originally by Reis. I have also read the work of my friend, Professor Silvanus Thompson, on this subject, and I have discussed the matter with him. I think I am in a position to supply a small link in the chain of evidence, which, though not important, may really prove to have a good deal, and certainly is not devoid, of interest. I was a student of medicine in the University of Edinburgh from 1860 to 1865, and being much interested in physical research, I was very frequently in the shop of Messrs. Kemp & Co., which used to stand near the entrance of the old Edinburgh Infirmary. Probably many of your readers have, like myself, visited that well-known establishment, and they will remember that it consisted really of two shops—one in which chemicals were sold, and the other, which had a separate entrance from the street, yet connected with the first by a door of communication, was occupied chiefly by physical apparatus, and was not common to the ordinary customers of the shop. Mr. Kemp died somewhere about the year 1861, and the business for some time, until, I think, about the middle of 1864, was managed by an extremely intelligent assistant named Mr. Shearer, of whom for many years I have entirely lost sight. Could Mr. Shearer be discovered, I fancy that he could give some extremely interesting information about the point which I am about to indicate.

As near as I can identify the date, in December, 1862, a very simple-looking instrument was shown to a number of his customers by Mr. Shearer. That instrument is depicted accurately on page 342 of your journal (Nov. 28, 1885). It was connected in a circuit with a battery, and by means of wires to a transmitter of a rather different form from that which you figure on the same page, but precisely identical with one which is figured on page 97 of Professor Silvanus Thompson's work. Mr. Shearer had his apparatus in action, the transmitter being arranged in the one shop, while the wires passed through to the receiver in the other. In common with many others of those who frequented the shop, I heard articulate words, which I could appreciate accurately, pass through this instrument from one shop to the other. At that time Mr. Alexander Melville Bell was a well-known teacher of elocution in Edinburgh, giving public readings, to which many of the young men of the town were strongly attracted. He was, indeed, a very well-known man in Edinburgh, and lived there with his family.

When I met Mr. Graham Bell at Plymouth, in 1877, when he first exhibited his telephone, I immediately recognized him as the son of Mr. Melville Bell. I cannot say whether he was resident in Edinburgh at the time that Shearer exhibited Reis' telephone in Kemp's shop, but I think it is very likely he was, and I feel almost certain that I have seen Mr. Melville Bell as one of the frequenters of that shop. So that it seems to me that nothing is more likely than that it was through this chain that Reis' telephone was transferred to America, and there became developed. Mr. Melville Bell was then engaged in the contrivance of a universal alphabet, upon which he has published an extremely interesting book. Reis' telephone was greatly talked about in Edinburgh at the time of its exhibition by Shearer, and I think it is extremely likely that Mr. Melville Bell would go to the shop to see it, and he might have been accompanied by his son.

LAWSON TAIT.

Birmingham, December, 1885.

[It is almost unnecessary to remind our readers that Dr. Tait is an eminent British physician, of distinguished ability, well known in this country.—EDS.]

Best Mode of Ventilation.

Speaking upon the subject of the ventilation of dwelling houses before the Toronto Sanitary Association, Mr. David Dick controverted the theory that the carbonic acid of an inhabited room can be drawn off by outlets placed at the floor level, which is the French practice. He pointed out that, in view of the principle of the diffusion of gases, it is impossible to expect that carbonic acid, although the heavier gas, will so far separate itself from the other components of the atmosphere as to be susceptible of withdrawal at a low level. According to Mr. Dick, the only factor to be regarded in ventilation is temperature. The air is cold at the floor line and warm at the ceiling; the difference in rooms artificially heated or full of people being seldom less than 20° Fah. Owing to this tendency of heated air to rise, and to be supplanted at the floor line by cold air coming in from crevices in the doors and windows, etc., Mr. Dick considers that a room cannot be properly warmed solely by the radiant heat of a fire. The heat from this source should be helped by some means for preventing the draughts of cold air on the floor.

With this view, Mr. Dick advises that rooms should be provided with many inlets for warmed fresh air at the floor line, the effect of which would be to drive up all impure air toward the hotter stratum near the ceiling. An outlet at the ceiling line would then carry off the whole of the vitiated air. As the warm air begins to rise as soon as it enters the room, the more it is subdivided into separate inlets the better, because it will ascend by the most direct line to the outlet; and therefore a number of small streams will move the general body of air in the room more effectually than one large current, which would be likely to pass through the body of air without affecting anything that did not happen to be directly in its path.

The temperature of the inflowing air should be moderate, and its velocity low. It is desirable, however, that there should be only one outlet for foul air from an apartment, because if there were more than one the draught might be unequal, and then one would pull against another, causing a flow of air down one and up the other, instead of from the proper inlets. Of course, the one outlet need not appear as such in the apartment, as its mouth may be concealed by a perforated cornice or other device.

Another Great California University.

Senator Stanford, of San Francisco, has executed a deed of trust by which lands and funds to the value of $20,000,000 have been devoted to the establishment of a great university at Palo Alto, Cal. This is the largest gift ever received by any institution, and makes the endowment of the new university larger at the beginning than that of any of the oldest colleges in the country. For several years Senator Stanford has been laboring to devise a satisfactory plan by which his wishes would be promptly carried out in case of death, and he has now accomplished this by the appointment of a Board of Trustees. He reserves the power to revoke their acts should they not carry out the spirit of the trust, and has taken every legal precaution to prevent the interference of his heirs with the enforcement of the bequest. The new university is a princely memorial to the Senator's dead son.

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Correspondence.

Making Water Heat Itself.

To the Editor of the Scientific American:

In the articles appearing in your columns, Nov. 7 and Dec. 12, in regard to making water heat itself by means of placing friction wheels in streams, Mr. Server and also Mr. Baker seem to overlook the prime fact that the water gives out the same amount of heat in falling through its channel that it would in falling through friction wheels—the heat given out being due to the fall of the water, not to the arrangement of appurtenances.

JAMES M. DOUGHERTY.

Dundaff, Pa., Dec. 12, 1885.

The Preservation of Stone.

To the Editor of the Scientific American:

In reply to your invitation, I would submit the results of some experiments which I have recently made. I used a heated mixture of two parts of paraffine and one part of boiled linseed oil, applying several coats successively. After the stone was thoroughly dry, I applied a mixture of two parts boiled linseed oil and one part japan, adding enough zinc to permit an even flow of the material over the surface. When this second coat was dry, the treatment was completed by a generous application of japan. I found that the oil penetrated the stone to a considerable distance. Summer would of course be the best time for treating so large a mass as the obelisk.

J. A. HACKER.

Houston, Texas, Nov. 15, 1885.

"A Gateway to Knowledge."

To the Editor of the Scientific American:

In current issue I notice the letter with above title, "from an old subscriber," and I take this opportunity to indorse its truths. As I now sit in my office, with my huge pile of the bound volumes of the SCIENTIFIC AMERICAN and SUPPLEMENT—the first dating June 2, 1849 (with some interruptions), down to the present time—I reflect that *very much* of what I know of science, of the manifold appliances of mechanics, I have gleaned from those pages. How oft, in all those past years, when in want of light on some difficult problem in the construction of machinery, I have consulted those pages, and found the solution, or have got hints that led me out! Yes, I owe very much to my great cyclopedia of useful and practical knowledge, the SCIENTIFIC AMERICAN.

G. M. MARSHALL.

Kilbourn City, Wis., Dec. 6, 1885.

Poisonous Fish at Rotuma.

To the Editor of the Scientific American:

Rotuma, or Rotuam—for the natives have the habit of transposing the two last letters of many words—is situated about 280 miles north and west of Fiji, and, although geographically beyond the limits of the colony, it is a portion of, and belonging to it.

One of the principal articles of food has always been fish, which are abundant, and of many kinds. Since, however, the hurricane of 1884, this article of diet has materially failed the people; the fish are as plentiful, but the greater number are now poisonous. Many deaths, and much painful and long sickness, have resulted from eating fish that, until the blow, had been wholesome. The fact was first noticed on the northwest side of the island, immediately after the hurricane, the fish along the other parts of the coast, and latest on the southwest end, continuing sound; but the cause, whatever it was, gradually spread, moving east-about, until on the whole coast of Rotuma the greater portion of the hitherto edible fish have become unfit for food, and dangerous to life and health.

There is a sea reef of considerable dimensions about three miles north of Rotuma; and, in the hopes that the fish here were not tainted, a fishing expedition visited the spot a short time ago, and returned with quite a number of fine fish. All who ate of the fish suffered severely, many being made seriously ill for days. For the cause of this strange freak in Rotuma fish nature, no one can account, and the natives are bewildered. Some of the few fish that yet remain safe to eat are rock seeders, some ground fish, and some eaters of their kind, but the numbers are few, and the fish small, and inferior in quality.

I returned from Rotuma a few weeks ago, and am personally cognizant of the foregoing facts. Perhaps some of your correspondents may be able to suggest a probable cause for this singular and, to the natives, serious abnormality in the usual traits of the fish at Rotuma.

ROBERT S. SWANSTON.

Fiji, October 15, 1885.

THE production of lead in Germany has doubled since 1858, in spite of a simultaneous increase in the production of Spain and in the growth of the lead yield of North America from almost nothing to 140,000 tons annually.

Astronomical Notes.

THE NOVEMBER METEORS.

There is a possibility that we may not have to wait until 1899 for a brilliant show of Leonids, or meteors of the 14th of November. Professor Kirkwood, of Bloomington, Ind., has made a discovery which, if substantiated by observation, will prove to be of great importance. It is generally accepted that the meteors of the 14th of November are caused by a swarm of meteoric particles moving in the orbit of Tempel's comet of 1866. Professor Kirkwood asserts that there are three meteor swarms traveling in the same orbit. The principal group of the three is the well known one that produced the showers of 1833 and 1866, another shower being expected in 1899. The period of this group is 33·25 years. The second group was identified in 1875 from the dates of meteoric showers given by Humboldt and Quetelet, the period being about 33·31 years. The next shower from this group will be due about the 14th of November, 1887, but the display may commence at that time in 1886.

The third group has been less thoroughly observed than either of the others. Its period is about 33·19 years, and another shower may be expected in 1912.

A comet was observed in China in 1366 that is thought to be identical with that of 1866. For 500 years the difference between the two dates is very nearly equal to 15 times 33·25 years. Professor Kirkwood suggests that the diminution of the comet of that year may have been caused by the separation from it of the first and largest of these groups.

The truth of this theory will soon be tested. If it be tenable, either next year or the year after a great meteor shower will take place, the Leonids will muster in full force, and the heavens will be aflame with falling stars. We have faith in the prophecy, but not without misgiving. Disintegrating comets and meteor swarms are curious members of the solar system. It will be long before we shall fully understand their origin, the place they hold in the economy of the universe, and their final destiny.

TOTAL ECLIPSE OF THE SUN ON THE 8TH OF SEPTEMBER.

Interesting observations have been reported from various observers in New Zealand who witnessed the recent total solar eclipse. It will be remembered that the only land over which the belt of totality passed was the portions of New Zealand bordering on Cook's Strait. Nothing new seems to have been learned during the progress of the most grand and imposing spectacle on which mortal eyes ever gaze. The observations were, however, successful and of exceeding interest. An observer in Wellington thus describes in *Nature* the wondrous vision. About fifteen or twenty seconds before totality, the whole disk of the moon suddenly became visible, the further limb of the moon being seen projected upon the white back ground of the corona. During totality, great masses of cloud, on the horizon, appeared lit up with sunset tints. The corona extended from the moon's limb more than two lunar diameters, the coronal light quivering in a way that reminded one of the aurora.

An observer at Nelson gives this account. As the period of totality passed, a bright point of light as from a diamond of wonderful brilliance shot forth from the upper surface of the moon. At first it seemed to be only a flame, but it speedily extended to the moon's shadow, passed downward, and totality was over.

The enthusiastic members of a party that had encamped at the foot of Otahuao, climbed to the top of the mountain, and arranged their instruments amid driving snow and hail. Just before totality the sky cleared, they were able to take several photographs successfully, and the grand phenomena attending a total solar eclipse were fairly visible.

The eclipse was observed at Blenheim on the outer edge of the belt. The totality here lasted but a few seconds; but the corona and rosy protuberances were plainly visible in all their grandeur and beauty. Several stars were seen, and the general appearance of the sky, the shadows on the hillside and on the water, was that of early dawn.

An observer at Tahoraite, 40 miles north of the center line, devoted his entire attention to the corona, and succeeded in obtaining several satisfactory sketches of its contour. He describes a dark rift in the corona reaching to the sun's disk.

Other observers noted that an immense red flame shot out suddenly close to this rift just as totality closed. Southerly squalls, hail, and snow prevented observation at several stations. All observers, however, agree in noting the sudden fall of the temperature, the numerous rosy protuberances, the beautiful sunset hues, the quivering of the corona, and the magnificence of the spectacle, which words are powerless to describe.

THE CORONA VISIBLE TO THE NAKED EYE ON HIGH MOUNTAINS.

Professor Tacchini, a great authority among scientists, gives a remarkable piece of information in a letter to *L'Astronomie*. He records that M. Favel asserts that on high mountains, when the sky is serene, the solar corona is so apparent that it strikes all observers. The mountaineers and dwellers among the Alps agree in affirming that the phenomenon is something entirely new. Tacchini also gives an experience of his own on the subject. He made the ascent of Mt. Etna in July last. When near the volcano, at a height of over 10,000 feet, under a clear sky of a dark blue tint, he saw the sun surrounded by a white aureola, concentric with a magnificent corona of a coppery red. The corona was transformed near the horizon into an arc less defined and of much greater extent.

"The Dollar Medical Shop."

A Hartford correspondent, who signs himself "A Druggist," has entered a protest against the reference to his class in an article under the above caption, which appeared in a recent issue. He begs to remind us that the large responsibility of an apothecary, which forces him to satisfy himself that the prescribed doses are correct, that the ingredients are mixed so as to give the full effect of all, and that the mixture does not form an explosive compound, together with the time required in preparing the prescription, make it absolutely necessary that his charge shall be largely in excess of the simple cost of the unmixed drugs. These considerations we have not overlooked, and they are of sufficient weight to make a profit of two or even, in some cases, three hundred per cent quite justifiable. If the matter stopped here, reasonable people would not be disposed to complain; but when the percentage is carried beyond this, and occasionally is doubled or even trebled, there is just cause for a protest. There is another element which deserves attention in connection with this excessive charge. In almost all lines of business, competition lowers prices; but in the prescription department of most drug stores, it seems to have had the opposite effect. Fancy goods and the thousand and one ready made articles which make up the stock of a retail druggist are open to comparison, and their price is regulated accordingly; but in a prescription the ingredients are usually unknown to the purchaser, and he has therefore no standard of comparison by which to judge of their value. As the same prescription is seldom filled at two different shops, there is really no competition, for the purchaser cannot assert that one man is more excessive in his charges than another. Add to this the fact that there are probably twice as many drug stores in the country as can possiby make a comfortable living, and it cannot be denied that there is a strong temptation for the charge to be made out of all just proportion, when there is so little chance of the extortion being discovered. All druggists, to be sure, do not yield to this temptation, and our Hartford correspondent is no doubt one of the exceptions, but a sufficient number of them do, to make it very well worth the attention of the benevolent to see that the poor are supplied with medicines at a cost more nearly approximating to their real market value.

The Van Depoele Electric Railway.

The city of South Bend, Ind., has introduced an electric street railway. The system in use, the Van Depoele railway, has been in successful operation at Toronto, Canada, for the past two years, and it is expected to be introduced shortly into Minneapolis and Detroit.

The railway at South Bend is operated by an electric current transmitted by overhead wires. The current is generated by three Van Depoele dynamos, which form the stationary motive power plant, and is conducted to the motor of the street car by means of a wire extending from the overhead cable. From the motor, the current passes through one of the wheels, and by means of the track the circuit is completed. In order to make the track a perfect conductor, strips of brass are laid under the joints of the rails. As but one track is used, the cars must pass each other on switches, and an ingenious device provides for this necessity. It consists of a brass and copper frog or switch, attached to the copper wire. This hangs directly over the frog in the track. It is so arranged that the motor connecting wire passes through it on one side when going in one direction, and through on the other side when returning. The action is entirely automatic. A speed regulator is attached to each car, and operated by the driver. It consists of a small cylinder through which the current passes. A crank handle on the top of this cylinder regulates the speed, and its position in numbered notches shows at a glance the rate at which the car is traveling. The highest speed allowed by the regulator is eight miles an hour. The railway has been constructed under the personal supervision of the inventor.

A New Comet.

A cable message from Dr. Krueger, of Kiel, received recently at the Harvard College Observatory, announces the discovery of a faint comet at Paris. Its position at the time was: right ascension, 39′ 8·5″; declination north, 21° 2′ 25″; daily motion in right ascension, 2′ 28″; in declination south, 3′. It has since been observed at Harvard by Mr. Wendell, and its position determined on Dec. 2 to be: right ascension, 2[illegible] declination north, 21° 0′ 30″.

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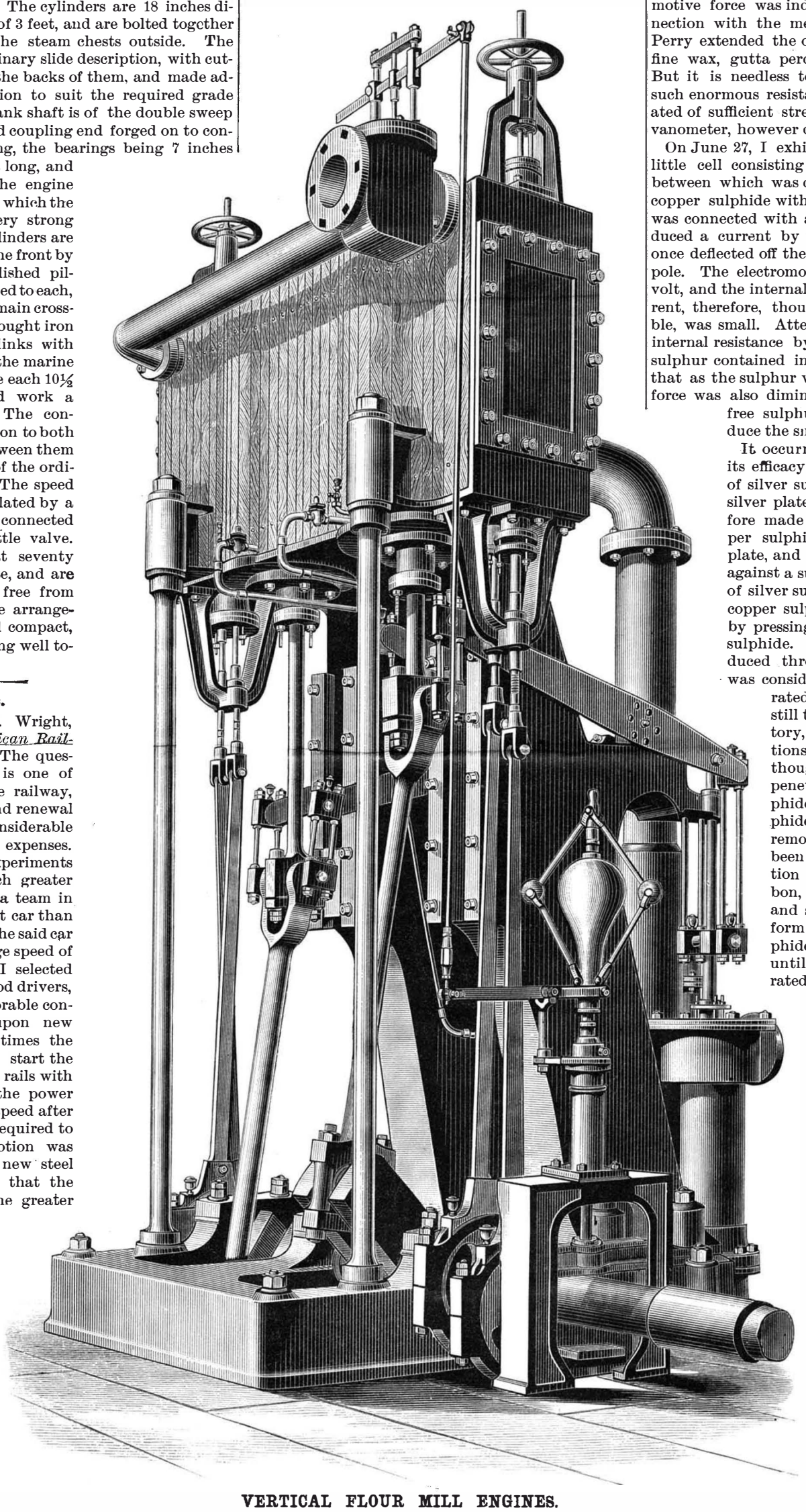
VERTICAL FLOUR MILL ENGINES.

These engines were made for driving a flour mill at Wolverhampton, and the particular design shown in our engraving was, says *Engineering*, adopted to suit the peculiar circumstances of the case, no room being available for engines of the horizontal description. As will be seen, the engines are of the vertical inverted cylinder marine type. The cylinders are 18 inches diameter, with a stroke of 3 feet, and are bolted together in the middle, with the steam chests outside. The valves are of the ordinary slide description, with cut-off plates working on the backs of them, and made adjustable while in motion to suit the required grade of expansion. The crank shaft is of the double sweep marine type, with solid coupling end forged on to connect to the mill shafting, the bearings being 7 inches diameter by 11 inches long, and three in number. The engine bed and the frames on which the cylinders rest are very strong and rigid, and the cylinders are further supported at the front by two wrought iron polished pillars. An air pump is fitted to each, and worked from the main crossheads by means of wrought iron levers, and coupling links with brass blocked ends of the marine type. The pumps are each 10½ inches diameter, and work a stroke of 18 inches. The condenser, which is common to both pumps and placed between them on the engine bed, is of the ordinary jet description. The speed of the engines is regulated by a quick-speed governor connected to an ordinary throttle valve. These engines run at seventy revolutions per minute, and are perfectly steady and free from vibration. The whole arrangement is very neat and compact, the different parts lying well together.



VERTICAL FLOUR MILL ENGINES.

Car Starters.

Mr. Augustine W. Wright, writing to the *American Railroad Journal*, says: The question of car starters is one of interest to every horse railway, for the original cost and renewal of horse flesh is no inconsiderable item of the operating expenses. I made a number of experiments to ascertain how much greater force was exerted by a team in *starting* a loaded street car than was required to keep the said car in motion at an average speed of six miles per hour. I selected steady teams and good drivers, and under these favorable conditions found that upon new steel rail tracks 7·1 times the power was exerted to start the car, and upon old iron rails with low joints 4·1 times the power used to maintain the speed after starting. The power required to keep the car in motion was much less upon the new steel rail tracks, and shows that the better the tracks the greater the relative loss in starting the loaded car. With a poor driver, who allows his team to start quickly, the relative loss is much greater, and no inconsiderable inconvenience is caused the unlucky passengers.

It is chiefly the wear and tear of starting the heavy load of car and passengers which give our horses such brief railway lives. If the pavement in the horse paths consists of any other than well selected cobble stones of suitable size and shape, the horses slip and frequently strain their backs—an injury from which they never recover. To guard against this slipping during unfavorable seasons of the year, their shoes are removed and calks sharpened. When our horses were traveling upon wooden blocks, at times their shoes were removed and sharpened every *third day*. This caused rapid hoof depreciation, but was the only way to keep them upon their feet. The leverage system I believe practicable, but the machinery must be strong and light, so that the energy saved in starting may not be lost in transporting it during the time when it is not in use. It must be cheap and readily applied to existing cars without requiring any cutting of woodwork or changes in their construction. It must be simple, with few wearing surfaces to be cut by the sharp grit arising from the street. It must be automatic, worked by the team without intervention of the driver. We all know that the driver, when out of sight, is not going to trouble himself to assist the horses. Horse railways would undoubtedly welcome such an auxiliary to their horse flesh, for it means a saving of many thousands of dollars in operating expenses.

A Voltaic Cell with a Solid Electrolyte.

I believe that there has never hitherto been made a voltaic cell with a solid electrolyte which was capable of generating the smallest sensible current—at least at ordinary temperatures. Sir William Thomson found that when warm glass was placed between plates of zinc and copper, the existence of an electromotive force was indicated by an electrometer in connection with the metals; and Professors Ayrton and Perry extended the observation to the cases of paraffine wax, gutta percha, India rubber, and shellac. But it is needless to say that with electrolytes of such enormous resistance no current could be generated of sufficient strength to be detected by any galvanometer, however delicate.

On June 27, I exhibited to the Physical Society a little cell consisting of plates of silver and copper, between which was contained a mixture of 1 part of copper sulphide with 5 of sulphur. When this cell was connected with a reflecting galvanometer, it produced a current by which the spot of light was at once deflected off the scale, copper being the positive pole. The electromotive force was found to be 0·07 volt, and the internal resistance 6,537 ohms. The current, therefore, though far more than merely sensible, was small. Attempts were made to reduce the internal resistance by diminishing the proportion of sulphur contained in the mixture, but it appeared that as the sulphur was diminished the electromotive force was also diminished, until, when there was no free sulphur at all, the cell failed to produce the smallest measurable current.

It occurred to me that the sulphur owed its efficacy to the fact that it formed a film of silver sulphide upon the surface of the silver plate by direct combination. I therefore made a cell thus: A thin layer of copper sulphide was spread upon a copper plate, and compressed into a compact mass against a surface of polished steel. A layer of silver sulphide was then spread upon the copper sulphide, and the cell was completed by pressing a silver plate upon the silver sulphide. The current which this cell produced through the shunted galvanometer was considerably stronger than that generated by the cell first described; but still the result was not quite satisfactory, and there seemed to be indications of short circuiting, which I thought might possibly be due to the penetration of particles of copper sulphide through the layer of silver sulphide. The silver plate was therefore removed from the cell, and, having been brushed over with a weak solution of sulphur in bisulphide of carbon, it was heated over a gas flame, and soon became covered with a uniform and continuous coating of sulphide. The heating was continued until all the free sulphur was evaporated. When the cell was reconstructed with this prepared plate, it produced a current of 6,800 microamperes through an external resistance of 0·2 ohm, and was able to deflect the pivoted needle of an ordinary coarse galvanometer.

The dimensions of the cell are as follows: The copper and silver plates measure 2½ inches by 2 inches; the thickness of the two layers of sulphide (strongly compressed) is about one-twentieth inch; the E. M. F. is 0·053 volt, and the internal resistance is therefore about 7 ohms.

This cell seems to be exactly analogous in its action to a Daniell cell, in which plates of copper and zinc are immersed in solutions of copper sulphate and zinc sulphate. Silver is probably the best (or only) possible metal for the positive plate, but some other metal might perhaps be substituted for the copper with advantage.—*Shelford Bidwell, in Nature.*

Death of a Remarkable Man.

M. J. B. Bailliere, the well known publisher, medical bookseller, and founder of the firm that bears his name, died on the 8th instant, in the eighty-ninth year of his age. He was the senior of the medical publishers of Paris, and although he became blind during the latter part of his life, he was, even to within the last few days of his death, to be found at his post, which he occupied for nearly seventy years, and during which time he published some of the most important French medical works extant.

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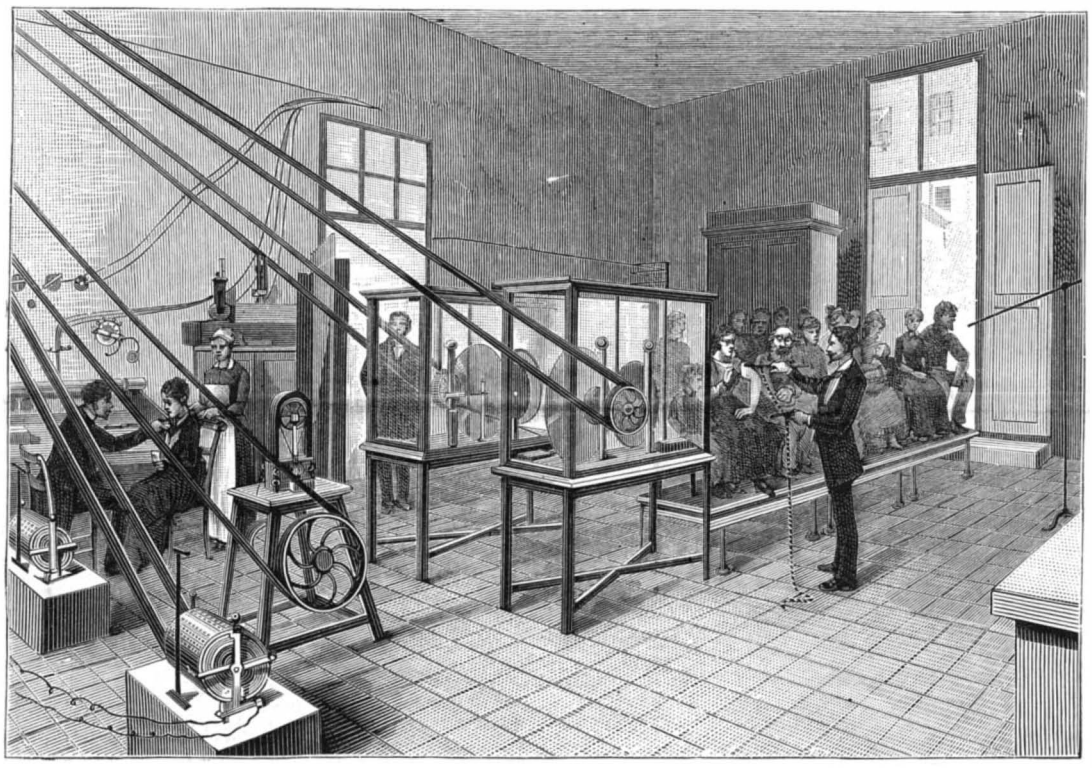
A Ship Canal from the Baltic to the Ocean.

The project of connecting the waters of the Baltic, the Elbe, and the German Ocean has been under the consideration of the Prussian Government since 1865. The scheme of a ship canal was formerly opposed by Count von Moltke, on the ground that it would be better to invest the immense amount of money required by such an enterprise in building up the Imperial Navy. Now that this work has been completed, and a powerful fleet of ironclads stands ready to plow the waters of the new canal as soon as it can be opened, the Field Marshal of the Empire has changed his views, and declared himself in favor of the work. At a recent meeting of the Bundesrath, a bill for its construction was unanimously approved. It is held by the advocates of the canal that the defense of the German coast must always remain a divided task so long as no waterway connects the Baltic with the German Ocean, and German war vessels are forced to pass from one sea to the other by a route which exposes them to the danger of falling into the enemy's hands. The estimated cost of the work is put at 156,000,000 marks, or about $39,000,000. It will be strongly fortified, and besides its military value will be of much importance to commerce.

ELECTRICITY AT THE SALPETRIERE.

At the Salpetriere, electricity constitutes one of the chief elements in the treatment of the sick. In fact, the service of electrotherapy has existed here for a long time. Its creation, in 1877, was due to the initiative of Professor Charcot, and its organization was the work of Dr. R. Vigouroux, who has continued to direct it ever since its foundation. The patients, as their numbers are called, pass from the reception room into the room for treatment shown in the engraving. Most of them take a seat upon two rows of insulating stools, where they receive electricity from the two machines seen in the middle of the room. They are thus in the first place submitted, for a length of time varying with the case, to what is called an "electric bath." Then the operator, provided with special instruments of various forms, called "exciters," makes such an application to each person as the case requires. As soon as a patient has been thus electrified, he gives way to another. In this way the sixteen stools are constantly occupied. The number of persons electrified at each sitting is 180, on an average. Those who are not to sit upon the stools go over to the electro-therapeutic table (shown to the left), where they receive electric applications of a different kind. The total number of persons treated at each sitting may be estimated as 200.



ROOM FOR ELECTRIC TREATMENT AT THE SALPETRIERE.

There are two categories of patients, viz., the inmates of the Salpetriere, and those from the outside, who come solely for electrical treatment. The inmates, of both sexes, belong for the most part to Professor Charcot's wards. As for the outsiders, many of them come from afar by rail, boat, etc. Numbers of these persons have a more well-to-do appearance than the usual patients of hospitals.

The original and important element of this organization consists in the use of electric machines. These latter, which had nearly ceased being used in medicine, have been very successfully applied by Dr. Vigouroux in the simultaneous treatment of a large number of sick persons. Without them, that is to say, with the ordinary processes of electrotherapeutics, the most active physician cannot treat more than twenty patients per sitting—which is an insufficient number. The electric machine solves the problem of the extension of the benefits of electricity to an indefinite number of patients.

Dr. Vigouroux has been kind enough to inform us as to the results of this electric treatment. They are, according to him, of the most satisfactory character. We believe, with most physicians, that nervous affections are nearly the only ones amenable to electricity. This, according to Dr. Vigouroux, is too narrow a view to take of it. At the Salpetriere almost all complaints are represented in the patients who succeed each other on the stools. In Dr. Vigouroux's opinion, electricity, especially static, must be considered as a stimulant and a regulator of the general nutrition. But it is not our object to write a medical criticism; and we shall confine ourselves to the descriptive side of the subject under consideration. Those persons ignorant of medicine who accompanied us were especially struck by the indifferent attitude of the patients sitting upon the insulating stools. One had unfolded a newspaper, another was doing crocheting, a baby was asleep upon its mother's knees, and, in curious contrast, the hair of each member of this quiet party was standing on end through the effect of the electricity. The calmness diminished slightly when the operator drew some sparks with a metallic ball; but, positively, the treatment appeared to us very mild, and was certainly borne very willingly by all these patients. Several, who were very infirm, were seated in large arm chairs or lying upon stretchers placed upon the insulating supports.

The electric machines are, as shown in the figure, inclosed in glass cases that preserve them against dust and dampness. They are of the Carre system, but arranged horizontally. Dr. Vigouroux is now having others constructed on a new plan. The manner in which they are set in motion merits special mention. A Gramme motor located in the room actuates a shaft, on which there are distinct pulleys that receive two belts for the electric machines and one for a laboratory Gramme machine. The current is furnished by a dynamo situated about 600 yards off, alongside of the large steam engine of the laundry. This transmission of power was put in by the house Breguet.

A small laboratory alongside of the room for electric treatment serves for experiments or researches.—*La Nature.*

High Speed on the Ocean.

The speed of ocean steamers has, as we know, increased very much during the last few years. It is not so long ago that nine days was looked upon as a quick passage in a transatlantic liner, and eight days a remarkable trip. Now, anything over seven days is regarded as a slow trip; the record having been brought down to six days ten hours and ten minutes, reckoned from the moment of losing Sandy Hook lightship to the sighting of Fastnet light. Referring to this and other fast trips made by the Oregon, her designer is reported to have prophesied that the trip would eventully be reduced to six days; and this is probably the best that can be expected, even when the present type shall have been developed to its best. Others have sought for more speed by lessening the draught and increasing the beam, but have not yet found it. All seem to think that higher speed is to be found in a change of lines and distribution of weight. The theory of propulsion, however, has remained unchanged, a propeller operating in the same line as the ship's motion.

Now comes a mechanician who contents himself with the present model, but proposes to increase the speed by a radical change in the principles of propulsion. He gives his views so clearly, and brings to their support such cogent reasoning from a mechanical standpoint, that they seem worthy of serious consideration; and though perhaps failing to convince the naval architect, wedded as he is to certain mechanical theories, in which he has been trained, may at least succeed in interesting him as well as the general public, who have of late been attracted by naval designs in marine construction.

In a pamphlet before us, Capt. John Giles essays to show that a much higher rate of speed can be had by changing the position now given to the propeller at the stern of the ship, as well as its inclination or dip. He would put the propeller under the ship, and, as near as we can judge by his diagram, just forward of the mizzen-mast; giving it an inclination of 45° with the plane of the ship's motion. With a propeller thus situated, he believes he can get forty knots an hour where now only twenty are had. The theory is based upon the manner of propulsion of animals, in which, as we know, the efforts of propelling impulse all radiate at an angle from the line of motion.

He says: "The organs of propulsion obtain their impulse from the reactionary force of the water upon which they operate; and as the motion of the fish creates no current in the lines of the propulsive effort, there is no depreciation of the propelling force by the motion of the body, but the mechanical energy derived from fluid reaction is constant at all velocities. In this case the body is totally immersed in water, and the organs of propulsion are duplicated, so that the propelling forces may balance in the line of motion. How completely this principle is carried out may be seen from the flatness of the fish's head, which, if it were not balanced by the opposing mechanical force of the pectoral fins, would destroy the equilibrium of the fish's motion. In the case of birds that swim the surface or that fly in the air, and of animals that live on the land, they are all subject to the force of gravitation operating in their bodies; and though they all exhibit the same mechanical principles in their structure, yet their propelling organs are not duplicated in adverse directions, as in the fish, but the force of gravitation balances the oblique application of the animal's mechanical impulse, the two forces then uniting in the line of motion in the body. The bird which flies does not expend its force in the line of the body's motion, but upward at an angle to it, and against the weight of its body, and at such a varying angle as the exigencies of flight and the forces resisting it require to secure a forward motion. The power of the horse is not expended in the same line as the motion of the body, but in its maximum effort of draught, in a direct line between the resting point of the hind feet and the animal's center of gravity. It is the same throughout the whole animal kingdom. Every one has doubtless experienced the force with which a fresh cherry stone can be projected by nipping it between the thumb and the finger at such an angle as to impart to it a forward impulse. This simple experiment exhibits the whole principle of animal locomotion, which in all cases is the result of coupled forces, operating at an angle to the line of the body's motion, and uniting their impulses in that line upon the center of gravity of the body. Where the body is immersed in a fluid of the same specific gravity as itself, all the propelling forces are mechanical; but where the weight of the body operates, the mechanical force of the animal is expended against its gravity and at an angle to it."

As another instance in support of Mr. Giles' theory, the reader who can swim will remember that he goes fastest in the water when he kicks out at an angle of about 30° from the line of motion of the body, with the feet inclining downward.

But notwithstanding this and the mathematical and mechanical formulæ as to resistance of water and slip of propeller when in the usual position which Mr. Giles brings forward to sustain him, it is difficult to see how the results he confidently expects from his system are to be obtained. Looking at the diagram of the proposed ship, with its elongated overhang, it seems as if the action of the propeller, with its inclination of 45°, would result in lifting the light after-hull of the ship and in a consequent depression of her bows.

On the other hand, it is easily seen that the propeller would have a deeper average immersion, and that there would be a greater resistance of the water to the screw blades, due to the water of reaction being projected downward—an important advantage certainly.

The Fuel Used at the Mint.

Mr. D. M. Fox, Superintendent of the U.S. Mint, Philadelphia, Pa., says the fuel used exclusively in melting gold and silver is "Council Ridge" anthracite coal, carefully hand picked and screened. He adds: "After many years' experience, and many experiments with other grades of coal, we find the 'Council Ridge' anthracite to be the only fuel really suitable for the purpose, and we have discarded all others. We use the 'broken' coal size."

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ENGINEERING INVENTIONS.

A boiler flue cleaner has been patented by Mr. James M. Ferguson, of New Orleans, La. The nozzle has a central aperture in its disk portion, with an inner tubular extension, around which is an annular space opening through the disk portion, and connecting with a steam chamber of the nozzle, whereby the flue cleaner is operated to remove dirt and soot and prevent the formation of scale.

A slide valve has been patented by Mr. William Mitchell, of Altoona, Pa. It has a central exhaust chamber, and the steam inlet port is formed clear through the body of the valve, the tops or outer edges of the side bars of the valve at each side of the exhaust chamber standing back of the plane of the contact faces of the chamber walls which form the valve face, so as partly to equalize the pressure at both sides of the valve and reduce its length of travel.

A revolving cylinder engine has been patented by Mr. John J. Blair, of Cincinnati, O. Combined with a fixed piston and a revolving cylinder surrounding it, with a cylindrical chamber in the piston having a sliding valve, there is a rod connected with the revolving cylinder and the sliding valve, a sleeve surrounding one end of the rod, weighted levers on the sleeve, and a plate on the ends of the rod against which the ends of the weighted levers rest.

AGRICULTURAL INVENTIONS.

A cutting apparatus for reaping and mowing machines has been patented by Mr. Elias Hazelton, of Brantford, Ont., Canada. It consists of an endless chain of knives, made by chain links, with a projecting bracket from one side adapted for the attachment of a knife, so that when the chain is run back and forth along a guide rail the edges of the oppositely moving knives cut against each other.

A seed planter has been patented by Mr. Charles C. Kierulff, of Starke, Fla. It is a light wooden box, tapering to forman edge like a spade on its lower end, with a slanting partition to guide the seed, and a vertically-sliding gate, with other novel features, the device to be operated by hand to make the holes in the ground, and mechanically drop therein cotton, corn, and similar seed.

MISCELLANEOUS INVENTIONS.

A hat and bonnet fastener has been patented by Clara Abell, of Geddes, N. Y. Combined with a hat or bonnet is an elastic band having one end secured to the hat or bonnet, and having a hair pin attached to the opposite end.

A lumber drier has been patented by Mr. Orman A. Duke, of Clanton, Ala. It is so constructed that all the hot air and gases of the furnace are utilized directly in the drying of the lumber, while the flues are so arranged that there is no danger of the lumber being fired by sparks escaping from the furnace.

A toy cap exploder has been patented by Mr. Henry M. Dixon, of New York city. Its construction is such that, in exploding a paper cap, a representation of a bird perched upon the toy will fall off as if shot, and the sparks will be prevented from flying about.

A rosin holder for violins has been patented by Mr. James W. Angus, of Macon City, Mo. It consists of a plate having lugs for holding it on the violin, with spring jaws for holding the piece of rosin, whereby the rosin will be held in such a manner as to be at all times handy and convenient.

A ring holder for displaying rings to the best advantage has been patented by Mr. Max Eising, of New York city. It is a clamp made of sheet metal, with a slotted tongue, on one end of which a bow is formed, from which a bent tongue projects through the slotted tongue, and has a curved prong on its end.

A lock has been patented by Mr. William G. Mumma, of Warrensburg, Mo. It can be made right or left handed, and the case may be so arranged that it will serve for either a mortise or rim lock, all parts being of cast iron except the springs, making a cheap lock for barns and outhouses.

A braid board has been patented by Mr. Charles E. Barnes, of Paterson, N. J. It is made of two flexible parts connected at the ends, so that the board or card of which it is made, and the braid wound thereon, may be opened out and placed upon a reel for convenience in unwinding the braid from the board.

A wheel fender for carriages has been patented by Mr. James M. Todd, of Albert Lea, Minn. It is a movable or rotatable fender for the forward wheels of vehicles, held to the carriage axle by novel means, to prevent mud and dirt taken up the wheels from being thrown on the carriage or its occupants.

A money envelope has been patented by Mr. Patrick Scanlan, of Ida Grove, Iowa. It is of novel construction, for the use of express companies carrying valuable packages, so that after it has been sealed it will be secure against abstraction of its contents without breaking the seals or cutting or tearing it open.

A foot rest for shoeing horses has been patented by Mr. Benjamin Lear, of Woodstock, Vt. It is for supporting and holding horses' hoofs while paring, shoeing, and clinching the nails and finishing, and can be adjusted very easily to any desired height, while the horse's leg is not twisted or strained, and the hoof cannot slip.

An adjustable seat has been patented by Mr. Manoah Miles, of Russell, Kansas. Two slotted upright end pieces have a swinging seat board hung between them, with a hinged wing and a cross rod or pivots, passed through notched curved slots in the uprights, making a seat which can be easily adjusted for a lounge, invalid chair, etc.

A gas pressure regulator has been patented by Mr. Robert F. Hatfield, of New York city. It is contained in a case holding water or other liquid, and is so made as to give notice, by the flaring of the lights, when the liquid needs replenishing, and shut off the gas before the liquid becomes so low as to break the seal of the regulator.

A split gear has been patented by Mr. James Lawlor, of Fall River, Mass. Combined with a flanged hub are two or more wheel sections bolted on the flange, the sections having side recesses for receiving the flange, the wheel being readily fastened on or removed from a shaft without requiring the removal of other wheels and pulleys.

A safety stirrup has been patented by Mr. Henry Coates, of Newark, N. J. It has a pivoted guard to prevent the foot from entering too far into the stirrup, the latter being made in one piece and the entire guard in one piece, avoiding the necessity of several castings, while there is no need of a spring to hold the guard against the stirrup.

A bobbin for sewing machines has been patented by Mr. William W. Ford, of Elmira, N. Y. It has one loose head, with a spring to engage therewith and lock it closed on the barrel, to catch and hold the end of the thread on the bobbin preparatory to filling, and for afterward releasing the thread from its lock, saving time in filling, avoiding breakage, etc.

A telegraph insulator has been patented by Mr. Benjamin N. Deblieux, of Bay St. Louis, Miss. It is composed of two longitudinal sections placed together to form a joint in the middle and retaining the wire between them, with devices for holding the sections together, to support the line wire without wrapping or cutting, and altogether obviating a tie wire.

A bit fastening for bridles has been patented by Mr. Daniel Waters, of Wilkesbarre, Pa. This invention consists of a bit ring on which is formed an annular recess, with a plate to which the bit wires are fastened, the plate being placed around the annular recess formed on the bit ring, to prevent rapid wear of the bit end.

An artist's sketch book has been patented by Mr. William T. Brundage, of Brooklyn, N. Y. Combined with an artist's box are socket pieces on one end and a palette fitting in the box having at one end hook clips fitting in the sockets, to hold the palette on the end of the box, so that the holding of the palette in the same hand with the box will be facilitated.

A comb attachment for shears has been patented by Mr. Daniel M. Young, of St. Louis, Mo. The scissors blade has screw-threaded apertures near its opposite ends, through which pass thumb screws, fastening the comb through similar apertures in the back of the latter, the comb thus attached serving as a guard and to regulate the length of cutting the hair.

A vehicle axle has been patented by Mr. James I. McCalop, of Clinton, N. C. It has a cross slot in which is placed the tongue of the journal made separate from the main body of the axle, with other novel features, providing for adjusting the wheels upon the axle when worn at the hub, and at the same time maintaining them at the same distance apart.

A combined overshoe and leggin has been patented by Messrs. Henry Rudolph and Henry Schwenk, of Rico, Col. This invention covers novel details of construction and combination of parts for a shoe and leggin suitable for wear in cold mountainous districts, for warmth as well as for protection of the feet and ankles in a rough country.

An electric regulator for dampers has has been patented by Mr. Wilson E. Facer, of Cleveland, O. Combined with a flue and its dampers, magnets and armatures are made to open and close a damper, a battery and thermostat having contact points for directing an electric current to automatically maintain any desired temperature for which the device may be set.

A sash frame, holder, and casing for carriages, cars, and other uses has been patented by Mr. Albert Ayers, of Rahway, N. J. The casing has a curved groove with a "throw over" in the bottom of its throw over sash groove, and the sash frame has spring friction holders, the improvement being designed to keep sashes from rubbing or rattling, and to hold them firmly in position.

A ribbon and lace exhibitor and measurer has been patented by Messrs. William B. Gleason and Milo J. Harrington, of Albion, Pa. It consists of a drum or roller having an eccentric hub, while there is a reciprocating and swinging arm operated from the hub, and a counting wheel operated from the arm, whereby ribbons and lace may be measured automatically as they are drawn from the holder.

A photographic printing frame has been patented by Mr. William H. Lewis, of New York city. It has one or more swiveling locking springs applied to its back board and ears or lip pieces applied to the frame, to engage positively with the locking ends of the springs, the ears or catches being of a novel construction, and the whole calculated to allow of the progress of the printing being watched without danger of shifting the paper.

A polishing paper has been patented by Mr. Robert J. White, of West New Brighton, N. Y. Unsized paper is coated with a solution of rotten stone, pumice, or other polishing substance by making a solution of the latter in water of about the consistency of cream, the paper being then dried, when the polishing material is mechanically held in the interstices of and on the surface of the paper in a form convenient for use.

A portable hay and cotton press has been patented by Mr. Charles L. Barnard, of Byhalia, Miss. It is supported on wheels, so that it may be run into the field where it is to be used, and the front part of the press carries a windlass mechanism for operating the platen, the middle part being the press box proper, and the rear part being large enough to afford a space for placing hay or cotton, in which the follower reciprocates in forcing the material into the press box.

A telephone exchange forms the subject of a patent issued to Mr. William S. Ford, of Denver, Col. The invention consists of an apparatus for making connections on a switch board between a line strip and a connecting strip by means of a current acting upon the latter and another current operating electrical devices acting upon the line strip, these currents being sent to the switch board from an operator's table having upon it contact points in connection with the electrical devices at the switch board.

NEW BOOKS AND PUBLICATIONS.

CHEMICAL CONVERSION TABLES FOR USE IN THE ANALYSIS OF COMMERCIAL FERTILIZERS. By F. B. Dancy and H. B. Battle. Raleigh, N. C.: The Authors, 1885.

These tables are intended to dispense with the necessity of calculating the amount of any constituent in commercial fertilizers, from the weight of the precipitate obtained.

A GUIDE TO SANITARY HOUSE INSPECTION. By Wm. Paul Gerhard, C.E., New York: John Wiley & Sons, 1885.

It has been Mr. Gerhard's purpose, in writing this little book, to instruct the householder. The main features of sanitary house inspection are unfolded for his benefit, and are presented so briefly and so well that the scholar will find the perusal of his text-book a pleasure rather than a task. So many elements enter into the make-up of a truly healthy home that every housekeeper, no matter how thoughtful he may be, will find a guide in this matter absolutely essential if the inspection is to be at all thorough. Ordinarily, the examination of a house for either purchase or lease is limited entirely to visible qualities, and the points which really determine its healthfulness and desirability are lost sight of. Mr. Gerhard's book goes into a brief analysis of these features, and points out to the would-be tenant the chief matters which he should investigate in choosing either a city or country home. It is not intended to be at all exhaustive, but the hints which it contains, and the special points insisted upon, are calculated to give us healthier homes, and, as a happy corollary, a stronger people.

A SKETCH OF THE GEOLOGY OF CORNWALL. By Brenton Symons. London: The *Mining Journal*, 1884.

Undoubtedly the most striking feature of Cornwall is its ancient mining industries, which have been in almost continuous operation since the days of adventurous Phœnicians. A Cornishman has become almost synonymous with a miner, so wide is the reputation of the country for its mining. Although so old a country, and so well explored, its geology is in some respects still quite obscure. A wide diversity of opinion exists among those naturalists who have given it careful study. In describing the geological features, therefore, Mr. Symons has put forward his own views tentatively, and avoided so far as possible adding to the causes of controversy. He gives an excellent account of the different formations and a full description of the chief mining districts into which the country is divided, with the principal minerals which are made the object of search. Considerable attention is given to veins and their formation, since in few mining countries are the vein systems so complicated as in Cornwall, and probably in none have the theories offered in explanation been more absurd. The book is illustrated with a number of steel plates and a good geological map of the country.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

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Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 46.

Timber Gaining Machine. All kinds Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

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Crescent Steel Tube Scrapers are made on scientific principles. Crescent Mfg. Co., Cleveland, Ohio.

Curtis Pressure Regulator and Steam Trap. See p. 350.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hoisting Engines. D. Frisbie & Co., Philadelphia, Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 414.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest, cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly marked or labeled.

(1) J. A. W. writes: I want an instrument to give the per cent of sugar there is in the crude juice of the sorghum cane. A. The determinations of the specific gravity by the hydrometer are approximately correct; if these are unsatisfactory, you must use a polariscope. We should very much doubt the practicability of the other machine you mention.

(2) C. G. asks what to get to dissolve platinum. A. Platinum is soluble in aqua regia, a mixture of hydrochloric and nitric acids. It is not soluble in any single acid.

(3) F. B. P.—For how to remove marble stains, see SUPPLEMENT, No. 129. For black enamel to apply on bicycles with a brush: Dissolve in about 2 pounds of tar oil, ½ pound of asphaltum and a like quantity of pounded resin: mix hot in an iron kettle, care being taken to prevent any contact with the flame. When cold, the varnish is ready for use.

(4) F. M. Z. asks for a formula that will make tallow soap foam well. A. See "The Method of Making Soap," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 494. Numerous receipts are there given for tallow soaps that "foam well,"

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(5) C. A. asks: 1. How do the so-called fire eaters perform their feats, or what chemicals do they use to keep the fire from burning them? A. Dilute sulphuric acid, strong alum, and hard soap are the principal substances used. 2. What article which, when mixed with coal oil, will keep it from exploding? A. The explosive properties of coal oil cannot be removed except by so transforming it that it can no longer be used for burning purposes.

(6) F. J. E. desires information as to the value and process of manufacture of dissolved bone, a fertilizer used on wheat fields. A. Messrs. H. J. Baker and Bro., of 215 Pearl Street, New York, are the manufacturers of the fertilizer known as dissolved bone. It is excellent for wheat lands. As manufactured by a New York firm, it contains about 17 per cent of phosphoric acid, and is made by treating the bone with sulphuric acid in the proportion of 0·64 per cent of concentrated acid to each pound of bone.

(7) A. D. S.—Kerosene can be mixed with lard oil in small quantities with good effect for lamps. The kerosene should be 150° test. The quantity used must be determined by a trial as to the smoke-producing results. The browning of a gun barrel will not prevent rusting unless the barrel is oiled or varnished. Inside of barrel should also be oiled. No useful alloys of silver and steel can be made that will not rust.

(8) Student asks how he may obtain transfers or offsets from printed matter upon white paper—plate, litho, and type. A. The following process is given for the purpose of transferring engravings to paper: Place the engraving a few seconds over the vapor of iodine. Dip a slip of white paper in a weak solution of starch, and when dry in a weak solution of oil of vitriol. When again dry, lay a slip upon the engraving, and place both for a few minutes under a press. The engraving will be reproduced in all its delicacy and finish. Lithographs and printed matter cannot so be transferred with equal success.

(9) J. H. I. asks what size return tubular boiler it will take to run two engines, cylinders 2x3, revolutions 250, boiler pressure 100 pounds; and what horse power; cylinders or crank at right angles; and what size boat they would drive at about six or seven miles per hour? A. Your engines are 3 horse power, and will require a boiler of 40 square feet heating surface. With a 15 inch screw in an 18 foot boat you accomplish six to seven miles per hour.

(10) A. P. asks: What is the difference between coal oil and insurance oil? Also, what is black oil? A. By coal oil, we infer you mean the ordinary burning fluid, or kerosene. This is one of the distillates of crude petroleum, which is probably the "black oil" referred to by you. The "insurance oil" is a high grade of kerosene, having a greater density than the common article and a higher flashing point; in other words, an oil with a lesser tendency to explode than the common article.

(11) L. E. O'M. asks how to cut a pinion of 21 teeth on planer centers that are only divided with the numbers 16, 20, 36. A. By using the 20 index, and slotting the index catch so as to retrograde the index by one-twentieth for each tooth cut. The side of the index catch may be divided so that the length of one index notch represents 20 divisions arranged like a vernier; add one more division for the 21st tooth. Then, by drawing back the catch one division for each index division, the 20 index will produce 21 teeth. Make a trial, marking to see if the arrangement is working correctly before cutting the pinion.

(12) A. M. D.—There is no practical way of destroying the odors of melted tallow or soap boiling except by fire. You may put a close hood over the kettles, and carry the odors in a large pipe of tin or sheet iron to the boiler furnace or to the furnace that heats the kettles. Close all air inlets to the fire except from over the kettles. The only machinery for this purpose in use in this city is a sealed kettle boiled by steam, with a vent pipe extending under a fire, either under the boiler or separated. Such apparatus is used for rendering offal and dead animals for their fat.

(13) W. O. asks: 1. What is the difference between cast iron and malleable cast iron? A. Cast iron is iron that is melted and cast in moulds and used without further treatment. Malleable cast iron is iron that has been cast in moulds, and afterward annealed in annealing ovens for a considerable time to render it malleable. 2. What is meant by volts and ohms, used as terms in electricity? A. A volt is the unit of electromotive force. An ordinary or Daniell or gravity battery produces a current of about one volt. A machine which produces a current equivalent to that of one of Daniell battery will produce about one volt. The ohm is the unit of resistance. It is about equal to 350 feet of No. 9 telegraph wire. 3. What is the power of a chrome battery (bichromate of potash battery) aside of the Grenet? If they will run a 6 candle power incandescent light, how many? A. The bichromate of potash battery produces a current of about 2 volts. To run a 6 candle power of incandescent light will require about 4 to 5 cells of bichromate of potash battery. 4. I noticed, early one foggy morning, in looking at an arc light (Brush), that it had a full purple-pink cast. In looking at the same light on a clear morning through a frosted window (that was from the cold), it made the colors of a rainbow on the window. Is this spectacle natural with the light? A. The purple color of the arc lamp observed by you was probably due to the temporary elongation of the arc, the light produced by the long arc always having a violet tinge. It is not uncommon to see the colors of the spectrum in frost crystals. 5. Have you a book for sale called "Catechism of the Locomotive"? If so, what is the price? A. Yes. The price is $2.50.

(14) D. McP. writes: There is one man maintains that it does not take any more power on the pump to test a boiler that holds 5,000 gallons of water than one that only contains 50 gallons. I say, the more water, the more power on the pump (both boilers being perfectly tight). Will you be so kind as to decide the argument? A. It takes no more pressure on the pump piston to test a large boiler than it does to test a small one, but in testing the large boiler more water will be required to bring it up to the necessary pressure, and consequently more power will be consumed in testing the larger boiler.

(15) J. R.—You are making your magneto electrical machine too small to be of much service. It would not be much more expensive to make it much larger, and the labor of winding the armature would be less. Probably, with so small a machine, 6 sections, each wound with four layers of No. 32 wire, will secure the best results.

(16) C. A. B. writes: In making an electric machine, I used common green glass bottles for supports for the conductor, and the machine worked all right. I tried to better the appearance, and used flint glass rods for supports, and the machine would not work at all, under the same atmospheric conditions. I made two Leyden jars out of green glass and succeeded, and tried several out of good white glass and failed. A. The white glass contains a certain amount of lead, which renders it to some extent a conductor of electricity. The green glass which you used contained no lead and was therefore a better insulator.

(17) R. L. D. asks: 1. What size of wire and cores, and how many layers, will make the strongest electro magnet, using one cell of gravity battery in a circuit not to exceed 40 feet (besides spools)? A. Make the cores of your magnets 2 inches long and ⅜ of an inch in diameter; wind them with ten or twelve layers of No. 24 wire. 2. Why would not vulcanite plates answer in the place of glass ones in a Wimshurst electric machine? A. Vulcanite will undoubtedly answer, but on account of the oxidation of its surface it is not so durable and reliable as glass. 3. Take a copper tube which weighs one ounce per foot and a copper wire of exactly the same weight per foot—which will have the greatest resistance to the electric current? A. There will be no difference. 4. Which would melt first under a heavy shock of lightning? A. There might be a very slight difference in favor of the tube, on account of its surface being extended, so as to radiate more heat than the wire, but we think the difference will be inappreciable.

(18) G. A. C. writes: 1. The SCIENTIFIC AMERICAN SUPPLEMENT contains a description of an electric machine which, say, for instance, were it four times as large, would be sufficient for an arc light. Now, how can I calculate what size machine and wire to put on it if it would operate two lamps, and also how to calculate the wire for using about 30 incandescent lights at different times? A. We believe there is no rule which will enable you to calculate all of the dimensions of a dynamo electric machine so as to enable you to construct a machine to develop a given current; it is largely a matter of experiment. Much depends upon the quality of the iron used in the field magnet and in the armature, in the quality of the copper used for the conductor, and in the relative position of the various parts. 2. Why the United States incandescent machine is self-regulating? A. We believe the automatic regulation is effected by compound winding. For information on the construction of dynamos, consult Thompson's "Dynamo Electric Machines," Gordon's "Electric Illumination," and Dredge's "Electric, Illumination." As you fail to give your P. O. address, we are unable to send the SUPPLEMENT desired.

(19) U. O. C.—Follow the instructions for making an induction coil given in SUPPLEMENT, No. 160, omitting the condenser, and making the iron core removable, to vary the strength of the secondary current. A short piece of iron should be left in one end of the core to operate the interrupter; or, if desirable, you may make the interrupter entirely separate from the coil, winding it with coarse wire and placing it in the battery circuit.

(20) J. C. T. asks: What kind of an instrument is used for registering the degrees of heat in a forge or furnace, and where could I obtain a good description of a simple one? A. The instrument for measuring high temperatures is called a pyrometer. You will find different forms of pyrometers described in SUPPLEMENT, Nos. 198, 33, 228, 358, 172, and 256.

(21) L. O. W. asks: 1. What must be the diameter of a lens to reflect a picture 4 inches square to a size of 8 feet at a distance of 12 feet from the screen? A. A lens of 6 inches focus and 2 inches diameter. 2. Are there two lenses used in a polyopticon, or only one? A. Two lenses are used in a polyopticon, arranged on the same principle as the magic lantern, the light being placed on the side of the lens tube, so as to illuminate the picture.

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December 15, 1885,

AND EACH BEARING THAT DATE.

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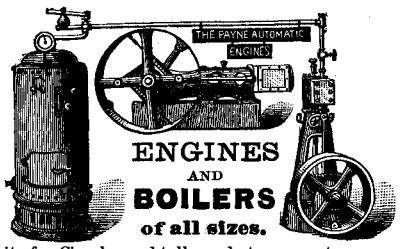

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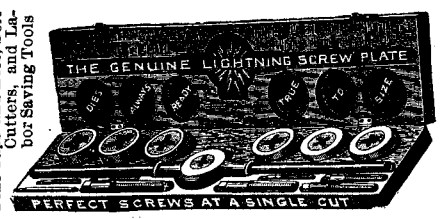

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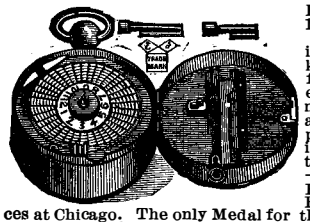

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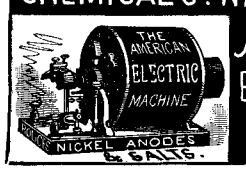

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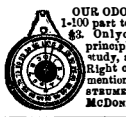

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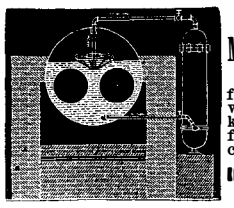

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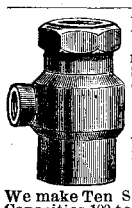

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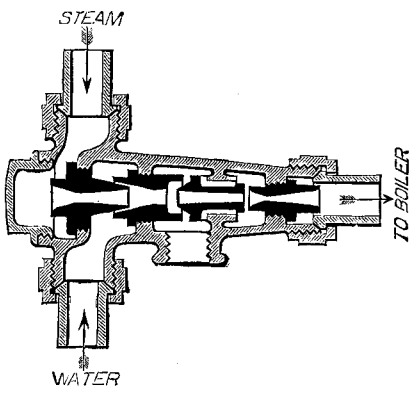

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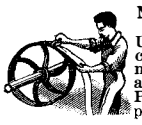

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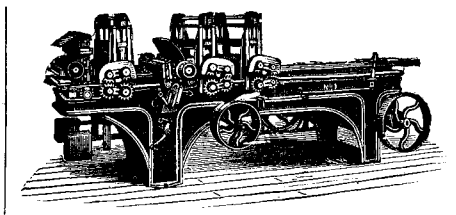

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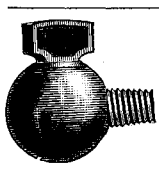

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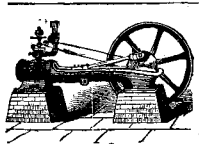

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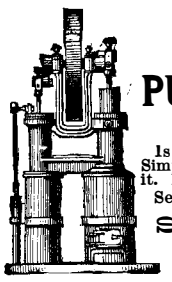

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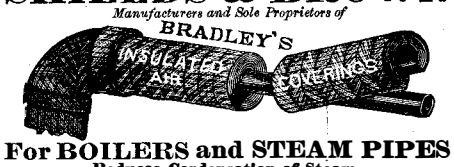

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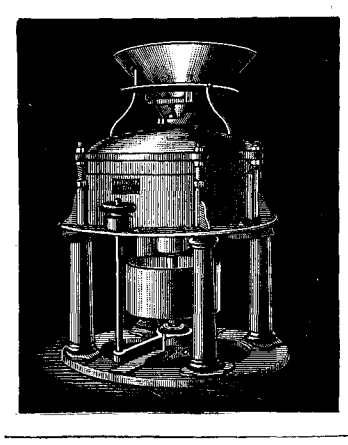

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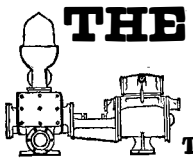

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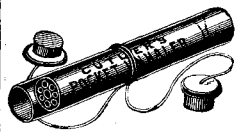

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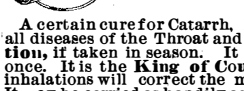

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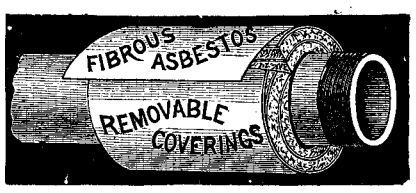

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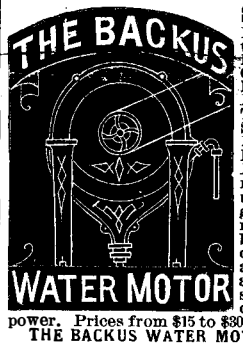

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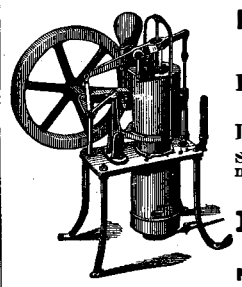

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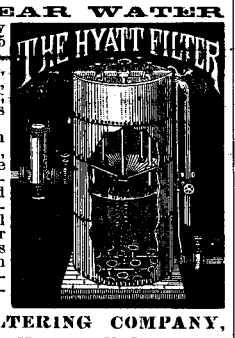

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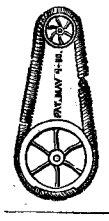

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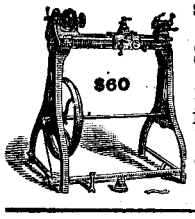

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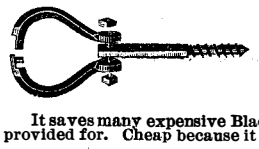

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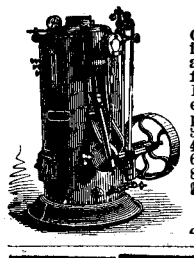

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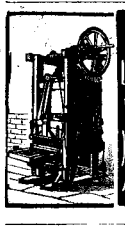

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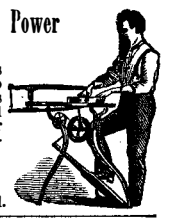

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